Appendix E. Public Health Technical Appendix

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Introduction

This appendix provides detailed information supporting the analysis presented in Chapter 5, “Public Health”. Part 1 describes the potential pathogenic microorganisms that have been known to be present in sewage sludges and provides data on the incidence of reportable diseases in California on a county-by-county basis and for each year for the past 6 to ~~8~~ 9 years. Part 2 describes the U.S. Environmental Protection Agency’s (EPA’s) development of the national sewage sludge regulations (Part 503 regulations). Part 3 provides information on endocrine disruptors, an issue of increasing concern with regard to long-term impacts of chemicals in the environment.

Part 1. Diseases of Interest

This section discusses each of the groups of potential pathogens of concern or specific potential pathogens of concern that may be found in biosolids and summarizes available information on the incidence of diseases they cause in California. This discussion is intended to provide background information for the impact analysis presented in Chapter 5. The information on disease incidence reflects the data collected by the existing statewide-public health reporting system, in which local health departments (three city and all county health departments) participate. The diseases that are reported are those that are diagnosed by a physician or at a hospital or clinic and represent only a small percentage of the actual cases which go largely unreported (for example the flu or an attack of gastroenteritis). For many diseases (amebiasis, campylbacteriosis, giardiasis, salmonellosis [other than typhoid fever], only summary counts of cases are reported to DHS and a thorough investigation by the local health department into each case of these diseases is not always conducted. Disease data is only reported for those whose illness results in a visit to a physician or local clinic or hospital, thus represents only a small percentage of the actual cases of illness that may occur. The true incidence of disease from pathogens causing gastroenteritis and other general symptoms that are normally treated with over-the-counter drugs will be underestimated and thus greatly affect any conclusions drawn from the disease incidence data reported herein.

The EIR reports only those cases reported and has contacted local health department personnel who might be knowledgeable about specific cases which might involve biosolids to obtain potential reports of interest to the GO evaluation of impacts.

NOTE: Many statistical tables previously presented (Numbered E1 through E16 in the text have been revised and corrected to include all available data are now at the end of the appendix in order. There are revised tables (E-1a through E-16a) for all reported diseases which include data for the years 1990-1998 (provisional statistics for the years 1996, 1997 and 1998 are included since minor adjustments to the records are still occurring). Each disease type has two tables. The first designated by a number and an "a" shows the number of reported disease cases by county or local health department. The second designated by a "b" (numbered E-1b through E-16b) shows the same information converted to an incidence rate based on the population of the city of county in which the disease was reported. This information was added at the request of the California Department of Health. Note that these numbers were calculated based on population estimates from the California Department of Finance. The disease statistics were provided by the California Department of Health Services. The data base they provided has been sorted and tabulated. Minor adjustments were made to the 1990 data to account for changes in the combined Humboldt/Del Norte County separation of reporting in subsequent years.

Bacterial Diseases

Enterotoxic *E. coli* O157

This mutant form of *E. coli* first appeared in the United States in 1982 and is one of hundreds of varieties of *E. coli* found in the intestinal tract of mammals (Padhye and Doyle 1992). It is mainly an infection in cattle that can be passed to humans who eat foods contaminated by cattle manure (even in organic gardens using uncomposted manure) or who eat inadequately cooked meat (Cieslak et al. 1992, Centers for Disease Control 1993, Nelson 1997). This particular variety, according to Wells et al. (1991), can be found in 1%–3% of all cattle in the United States but causes them no harm. The infection can be serious for a human host, however, causing severe, often bloody diarrhea. In the worst cases, particularly in young children, *E. coli* can kill. Most often, *E. coli* illnesses are associated with eating undercooked hamburger or uncooked fruits (apples and cantalopes) and vegetables (lettuce in particular) or with person-to-person contact (Belongia et al. 1993, Nelson 1997). Contaminated water supplies are also of growing concern (Jones and Roworth 1996). This particular bacterial strain is of growing concern as more outbreaks occur (Koutkia 1997).

The most well-publicized recent case of illness from *E. coli* is that of three children who died in Washington in 1993 after eating contaminated hamburgers at a fast-food restaurant (Centers for Disease Control 1993). In summer 1997, 25 million pounds of hamburger, potentially tainted with *E. coli* O157:H7, were recalled by Hudson Foods in Columbus, Nebraska, after consumer illnesses were reported. Illness caused by *E. coli* O157:H7 has been a reportable disease in California since 1993 after the first case was reported in San Diego County in 1992; the annual number of cases has ranged from 1 to 264, and occasional outbreaks have occurred throughout California (Table E-1a). Table E-1b shows the incidence rates for the various reporting entities.

[Note: draft EIR Table E-1 has been deleted and is being replaced by Tables E-1a and E-1b at the end of document.]

Like other pathogens of concern, the enterotoxic form of *E. coli* has a low infectious dose (estimated to be as low as 10 bacteria).

The present detection method for *E. coli* O157:H7 requires growing the bacteria in laboratory cultures, which takes days. A group of Montana researchers led by Dr. Gordon McFeters has developed a new method using an antibody test kit. The test takes only 4 hours; is highly sensitive; and works in food, feces, and water. The method could be adapted to detect other foodborne pathogens, such as *Salmonella*, and could be used at various points in beef supply processing to check for contamination.

Campylobacteriosis

Campylobacter jejuni, like *E. coli*, can cause severe cases of gastroenteritis (campylobacteriosis) and has been consistently listed as a pathogen of concern in relation to sludge management (U. S. Environmental Protection Agency 1985) despite a lack of information on its densities in sludges. This pathogen has outranked *Salmonella* as a leading cause of bacterial diarrhea (as in 1996), particularly in infants (Table E-2a). The reported incidence of gastroenteritis attributable to *C. jejuni* in California has ranged from 6296 to 8220 cases annually since 1990 (Table E-2a). A large percentage of the cases were reported to have occurred in Los Angeles County. Several hundred cases were reported in the three counties of the Central Valley where most of the biosolids land application occurs (see Chapter 5). Table E-1b shows the incidence rates for the various reporting entities.

Little has been reported in scientific literature about the levels of this pathogen in feces shed by ill people, its removal in treatment, levels in biosolids, infectious dose, or longevity in the environment (Feachem et al. 1980, U.S. Environmental Protection Agency 1985) as indicated in (Table 5-1 of Chapter 5).

[Note: draft EIR Table E-2 has been deleted and is being replaced by Tables E-2a and E-2b at the end of document.]

Salmonellosis and Typhoid Fever

The bacterial genus *Salmonella* consists of more than 2,000 known serotypes found in different reservoirs and locations, many of which are pathogenic to humans and other animals (Argent et al. 1977, 1981; Ayanwale 1980; Mishu et al. 1994). Ingestion of an infectious dose of *Salmonella* (usually a large number of bacteria is required, as shown in Table 5-1 in Chapter 5) can result in gastroenteritis, enteric fever, and/or septicemia. The two major disease syndromes associated with *Salmonella* are salmonellosis (gastroenteritis) and typhoid fever (enteric fever).

Salmonellosis. The major vehicle of salmonellosis is food (St. Louis et al. 1988, Mishu et al. 1994), although waterborne outbreaks have occurred. There are many zoonotic reservoirs for salmonellosis, including such domestic and wild animals as poultry, swine, cattle, rodents, dogs, cats, and reptiles. Waterborne outbreaks of salmonellosis occur worldwide and are associated primarily with fresh water.

Salmonellosis is characterized by acute abdominal pain, diarrhea, nausea, fever, and dehydration and is sometimes accompanied by vomiting. The illness can lead to complications and more serious infections. Death is not common except in the very young, the very old, or the debilitated.

It has been estimated that 400,000 to 3.7 million cases (17.3 cases per 100,000) of salmonellosis (including foodborne and waterborne transmission) occur every year in the United States (EOA 1995), with as many as 70% of the cases being imported from foreign travelers. Between 4,739 and 6,544 cases have been reported yearly in California over the past nine years (Table E-3a), with over 25% of the total being reported in Los Angeles County. Table E-1b shows the incidence rates for the various reporting entities. The incidence rates for California counties are typical of those reported nationwide ranging from 0 - 151.7 cases/100,000 with the highest rates being found the rural counties with low populations where a single case makes a big difference. Central valley counties were biosolids use is extensive do not appear to have any higher rates in recent years than other localities.

Recent research on the causes of a *Salmonella* outbreak among chickens has raised concern about the importance of *Salmonella* in wastewater management and indicates the need for constant vigilance and monitoring of the effectiveness of management techniques and disinfection methods (Kinde et al. 1996, 1997). Concern also exists regarding the transmission of *Salmonella* from biosolids to animals (Jones et al. 1980; Argent et al. 1977, 1981) and the ability of the pathogen to survive under hostile environmental conditions (Droffner and Brinton 1995); this ability makes them the indicator of choice for monitoring the effectiveness of biosolids pathogen reduction (U.S. Environmental Protection Agency 1992). In developing the Part 503 regulations, the EPA based its requirements for pathogen reduction and its risk assessments for protection of public health on *Salmonella* because of its high incidence rates, its ability to regrow, and its correlation with coliform bacteria (about 1.4 *S. typhi* per million 100,0000 coliforms based on a morbidity rate of 0.0018/100,0000 persons).

Typhoid Fever. Typhoid is transmitted via water or food contaminated by the feces or urine of a carrier. Fruits, vegetables, and milk contaminated by sewage or by the hands of carriers are also modes of transmission. The case-fatality rate for typhoid fever can reach 10% if symptoms go untreated; there are approximately 500 fatalities per year (0.2 per 100,000 deaths per year) in the United States.

[Note: draft EIR Table E-3 has been deleted and is being replaced by Tables E-3a and E-3b at the end of document.]

Shigellosis

The genus *Shigella* is made up of four species of rod-shaped bacteria that are all pathogenic in humans and other primates. The four species are characterized as groups or types: Group A, *S. dysenteriae* (10 serovars); Group B, *S. flexneri* (17 serovars); Group C, *S. boydii* (15 serovars); and Group D, *S. sonnei* (1 serovar). Shigellosis, an acute bacterial disease caused by *Shigella*, occurs worldwide, with outbreaks common under conditions of crowding and poor sanitation (i.e., jails, institutions for children, mental hospitals, crowded camps and ships). The reporting for the disease distinguishes between the four groups to help identify the sources and potential severity of the infection. From 1967 to 1988, annual isolation rates of *Shigella* reported to the Centers for Disease Control (CDC) varied between about 5 and 10 per 100,000 persons. It has been estimated that 5% of all symptomatic cases of shigellosis are reported to the national surveillance system. *Shigella* is considered the most highly communicable of the bacterial diarrheas; as few as 10 organisms have been reported to cause clinical illness (U. S. Environmental Protection Agency 1985).

For *S. dysenteriae* (Shiga bacillus) infection, case-fatality rates approach 20%; for *S. sonnei infection*, the infection is short-lived and the fatality rate is almost negligible, except in immunocompromised persons. Few cases are reported in California. The annual number of cases reported in the state ranges from 24 to 110 cases a year for Group A, 770 to 1957 for Group B, 87 to 232 for Group C, and 1522 to 3144 for Group D (Tables E-4a, E-5a, E-6a, and E-7a, respectively). Some 572 - 817 cases a year were unidentified as to type (Table E-8a). Incidence rates for the counties in which cases were reported for the various types are shown in Tables E-4b, E-5b, E-6b, and E-7b. Reported incidence rates are low except for a few counties in urban areas or where remote outbreaks occur in the rural counties. None of these cases has been associated with biosolids.

Shigella spp. has in the past been the most common bacterial pathogen implicated in waterborne outbreaks in the United States, but its occurrence has declined over time (Moore et al. 1993). Shigellosis also has been implicated in outbreaks associated with recreational swimming (Blostein 1991, Sorvillo et al. 1988).

Shigellosis is transmitted via the fecal-oral route, directly or indirectly, primarily from person to person via contaminated food and water. In areas of poor sanitation, food and water may play a greater role in transmission. Flies have been shown to be a vector in the transmission of the disease (Dunaway et al. 1983).

The survival of *Shigella* in water, soils, and plants depends on factors such as temperature and the concentration of other bacteria, nutrients, and oxygen. In various studies, *Shigella* has been shown to survive for up to 22 days in well water and even longer in colder temperatures (47 days) and up to 135 days in permafrost soils of Siberia (EOA 1995).

One detailed review of the scientific literature performed by EOA (1995) found no *Shigella* outbreaks associated with water where the source met the coliform standards at the time of exposure.

[Note: draft EIR Tables E-4 to E-8 have been deleted and are being replaced, respectively, by Tables E-4a and E-4b, E-5a and E-5b, E-6a and E-6b, E-7a and E-7b, and E-8a and E-8b. All sets of tables appear at the end of document.]

Protozoan Diseases

Amoebiasis

Amoebiasis, an infection caused by the environmentally resistant pathogen *Entamoeba histolytica*, is acquired by mouth contact. Symptoms can vary from minor abdominal cramps to severe diarrhea alternating with constipation. The incidence of disease from this protozoan is low; between 698 and 1,646 cases per year have been reported in California over the past nine years (Table E-9a) with a general decline in the rate over time.. None of the reported cases have been associated with biosolids or wastewater management, however, most cases are not investigated t the extent to make a definitive association. A majority of the reported cases in California were in Los Angeles County (including Long Beach and Pasadena), San Francisco and Santa Clara counties reflecting the size of the population and high number of travelers from these areas. This disease is associated often with travel in other countries, particularly in areas of Mexico. Incidence rates are shown in Table E-9b which show that San Francisco and Santa Barbara have experienced the highest reported rates in recent years.

[Note: draft EIR Table E-9 has been deleted and is being replaced by Tables E-9a and E-9b at the end of document.]

Crytosporidiosis

Cryptosporidiosis is a gastrointestinal infection that is caused by the protozoan *Cryptosporidium* spp. *Cryptosporidium* oocysts are shed by humans and animals in feces.

The infectious dose in humans is thought to be small; it is 10–400 oocysts in species other than humans. Little is known about the concentrations of viable oocysts in biosolids (Gerba pers. comm.) and the viability of oocysts in the environment, but oocysts are known to have the potential to survive months following their excretion (EOA 1995) and have the potential to survive more than a month following sludge treatment and land application (Whitmore and Robertson 1995). However, it has been found that conventional treatment and anaerboic digestion are effective in reducing the numbers of oocsysts in biosolids (Whitmore and Robertson 1995).

Modes of transmission for cryptosporidiosis include person-to-person contact, zoonotic transmission, and contaminated food and water. Person-to-person transmission is probably the most important mode and has been documented among family/household members, sexual partners, health workers and their patients, and children in day care centers. *Cryptosporidium* readily crosses host-species barriers as well, though, and human infections are often the result of zoonotic transmission. *Cryptosporidium* is harbored by more than 40 mammals. Reservoir hosts include calves, dogs, cats and rodents (Tzipori 1988).

Several waterborne outbreaks of cryptosporidiosis have been reported in the United States where the filtration component of water treatment was suboptimal (Milwaukee, for example - see below) (McKenzie et al. 1994). Cryptosporidiosis also has been associated with recreational use of swimming pools (Joce et al. 1991). Disease incidence in England associated with chlorinated water supplies and swimming pools indicates cryptosporidiosis resistance to chlorination (Furtado et al. 1998).

During a waterborne outbreak of cryptosporidiosis resulting from contamination of a public water supply that affected an estimated 13,000 people in Georgia, routine samples from the water system were found to meet EPA and State of Georgia standards for coliform bacteria (Robertson and Smith 1992). During another cryptosporidiosis outbreak associated with public water supply that led to an estimated 403,000 cases of diarrhea in Milwaukee, coliforms were not detected in samples of treated water (McKenzie et al. 1994). It should be noted that it is generally recognized that *Cryptosporidium* oocysts are removed or inactivated by effective and reliable water treatment practices where the water supply is not contaminated by dairy or pasture runoff (most often from flooding).

Cryptosporidium is found worldwide. Human cryptosporidiosis has been reported in at least 60 countries on six continents, with widely varying prevalence among those seeking medical care for diarrhea (EOA 1995). The prevalence is highest in non-industrialized regions: Europe,1% to 2%; North America, 0.6% to 4.3%; and Asia, Australia, Africa, and Central and South America, 3% to 20%. Seroprevalence rates in immunocompetent individuals are between 25% and 35% in the United States and are well over 50% in Latin America. Children generally have a significantly higher prevalence than adults, and infections are often seasonal, with a higher prevalence during warmer, wetter months.

No outbreaks associated with biosolids use have been reported in scientific literature or with the health agencies consulted during the preparation of this EIR. This disease is rare, with 311 to 6,141 cases a year reported in California for both types of Cryptosporidiosis, few of which are from areas where biosolids have been land applied (Tables E-10a and E-11a). Tables E-10b and E-11b show the incidence rates fo the two types of Cryptosporidiosis which have been their highest in remote Sierra County and in the San Francisco area and otherwise are quite low.

[Note: draft EIR Tables E-10 and E-11 have been deleted and are being replaced, respectively, by Tables E-10a and E-10b, and E-11a and E-11b at the end of document.]

Giardiasis

Giardia lamblia is a protozoan that principally infects the upper small intestine in humans, who can often be asymptomatic. *Giardia* infection, or giardiasis, manifests itself in the form of chronic diarrhea, abdominal cramps, weight loss, and fatigue that can last for months with relapses. It can progress to cause malabsorption syndrome, in which digestion is impaired and weight loss occurs. Certain immunodeficiency syndromes also may be associated with *Giardia* infection, and the infection is particularly devastating in immunocompromised persons. Carriers can shed *Giardia* for years, but a self-cure usually occurs within 2 to 3 months. The numbers of *Giardia* cysts shed in feces are highly variable but have been measured to be as high as 900 million per day (Feachem et al. 1983).

Before leaving the intestine, *Giardia* generally forms a resistant cyst, which is highly resistant to traditional disinfection techniques (EOA 1995). The cysts can remain viable in water for several months and can remain viable in soils as well, but cannot tolerate freezing (EOA 1995). It has been found that the presence of traditional bacterial indicators does not correlate with the presence of cysts, particularly in unfiltered but disinfected drinking water (EOA 1995). Negative coliform tests do not provide assurance that water is free of *Giardia* cysts; however, positive coliform results often correlate with *Giardia* outbreaks (EOA 1995).

The major reservoir of *Giardia* is humans, but there is evidence that humans may acquire infections from other animals. Beavers may be a reservoir and have been implicated in waterborne outbreaks (EOA 1995). Dogs, gerbils, guinea pigs, beavers, raccoons, bighorn sheep, and muskrats have all been shown to be carriers of *Giardia* (EOA 1995).

Giardia infection is transmitted through contaminated water supplies, foodborne outbreaks, and person-to-person contact, with the later being the most prevalent means of transmission. Individuals with impaired immune function appear to have increased susceptibility to *Giardia* infection.

The numbers of *Giardia* cysts in biosolids have been estimated to range from 10 to 10^3 per gram with no removal via treatment. However, significant viability reduction occurs during digestion, estimated in laboratory studies to be as high as 99.9% inactivation (Straub et al. 1993, Cravaghan et al. 1993). Class A treatment requires that treated biosolids contain less than one protozoan cyst per gram. For Class B sludge generated in Australia, it has been found that anaerobically digested and mechanically dewatered sludge had cysts present at levels of public health concern after 1 year, but that cysts were destroyed after only 12 weeks following soil amendment (Hu et al. 1996).

Giardia is found worldwide. The prevalence of *Giardia* infection worldwide has been estimated to be about 7%, and infection is more common in children than adults. Prevalence rates vary between less than 1% and 50% and depend on the population sampled, infection rates being highly dependent upon sanitation and the quality of drinking water. Areas of the United States known to be associated with increased risk of infection are usually mountainous and include New England, the Pacific Northwest, and the Rocky Mountains.

The number of cases reported in California is variable, ranging from 4,029 to 7,850 per year (Table 5-6 in Chapter 5) and Table E-12a. The incidence in California is the highest in Los Angeles County. The number of reported in Kern, Merced, and Kings Counties, where the majority of the biosolids application currently occurs (Table E-12a) have shown a slight declining trend and moderate incidence rates. No cases of the illness associated with biosolids operations have been reported (Cook and Shaw pers. comms.). Overall incidence rates are highly variable as shown in Table E-12b.

[Note: draft EIR Table E-12 has been deleted and is being replaced by Tables E-12a and E-12b at the end of document.]

Viruses

Hepatitis A

The hepatitis A virus (HAV) is a virus physically resembling an enterovirus that causes hepatitis A, an illness with the symptoms of fever, nausea, malaise, anorexia, and abdominal discomfort, followed by jaundice. The disease can be mild, lasting 1 to 2 weeks, or severe, with disabling effects lasting months in rare cases. The recovery period is usually prolonged. The case-fatality rate has been reported to range from 0.04% in children 5–14 years old to 2.7% in adults over 49 years old, with typical case-fatality rates of 0.1–0.5%. Relapse rates can be as high as 20%. Hepatitis A can be diagnosed by the detection of virus in the stool or the presence of IgM antibodies against HAV in the serum of persons who are acutely ill. There is currently no specific treatment for HAV.

The normal reservoir of HAV is acute-phase humans; there is no known carrier state. Mode of transmission is via the fecal-oral route, with person-to-person transmission being the most frequent means of transmission, usually via water or food. HAV can survive for long periods on inanimate objects and on human hands; therefore, food contamination by infected persons is a major area of concern. In the United States, waterborne outbreaks have been estimated to contribute 0.4%–8% of all HAV incidence, and no waterborne disease outbreaks have been shown to have been directly associated with biosolids. The majority of waterborne outbreaks in the United States involve small private or semiprivate water supplies with or without chlorination; these outbreaks are usually attributable to plumbing-sewage cross-contamination or to a raw-water source being so grossly polluted with sewage that virus levels cannot be eliminated by treatment of the water using conventional methods. The infectious dose is estimated to be in the range of 1 to 10 plaque-forming units (PFUs).

Little is known about persistence of hepatitis A in the environment. Survival in water has been recorded for as long as 40 days in surface waters and 70 days in groundwaters (EOA 1995). Levels in biosolids have not been reported in anaerobically digested sludge.

There is no known direct correlation between HAV and indicator organisms such as coliform bacteria, fecal streptococci, acid-fast bacteria, or coliphage.

Hepatitis A has a worldwide distribution. Since 1920 in the United States, there have been about 15 reported outbreaks of HAV associated with drinking water, most of which are reported from areas with poor sanitation or contaminated water supplies (Singh et al. 1998). In California, the number of Hepatitis A cases has ranged from 4,197 to 6,773 annually over the past nine years (Table E-13a) with a relatively variable incidence rates (Table E-13b) in individual areas with only a few cases contributing to high rates in the smaller counties (Del Norte, Sierra, and Humbolt counties).

Incidences in counties where biosolids are being land applied have not increased since land application was intensified in recent years, and no cases have been reported in most instances in the past nine years. None of the cases reported can be related to the handling or use of biosolids.

[Note: draft EIR Table E-13 has been deleted and is being replaced by Tables E-13a and E-13b at the end of document.]

Viral Meningitis

"Viral meningitis" is the general term that refers to all serious viral diseases (not gastroenteritis of unknown origin) that have been reported. Included as causative agents and reportable as viral meningitis are the Coxsackievirus A and B, Echovirus, and new enteroviruses (acquired orally). It is unknown how many viruses cause gastroenteristis and flu-like symptoms that are unreported. The reportable cases of viral infections have ranged from 1,146 to 3,648 per year (Table E-14a). Most of the cases are reported in the more urbanized counties and the numbers of reported cases are largely proportional to population. Recent years have shown a decline in the number of reported cases in Kern County where large-scale land application is presently practiced. There is no reported information indicating that any of the cases are associated with biosolids land application operations. Incidence rates over time have been highly variable in most areas and generally moderate as shown in Table E-14b.

[Note: draft EIR Table E-14 has been deleted and is being replaced by Tables E-14a and E-14b at the end of document.]

Gastroenteritis

Gastroenteritis is a widespread disease that can be caused by numerous known and unknown viral agents. Person-to-person transmission is the principal mechanism for the spread of many infections; therefore, the most important element in preventing and controlling outbreaks is improved environmental hygiene (i.e., food, water, and sanitation).

When foods other than shellfish are implicated in viral gastroenteritis outbreaks, the contamination has usually taken place near the point of consumption (shellfish are not discussed in this EIR because of the nature of the project). Ill food handlers were identified in nine of the 15 documented Norwalk outbreaks reported to the CDC from 1985 to 1988 for which adequate epidemiologic data were available (Centers for Disease Control unpublished data). Foods that require handling and no subsequent cooking (e.g., salads) constitute the greatest risk. Among Norwalk-confirmed foodborne outbreaks from 1976 to 1980 that were not attributable to shellfish, salad was the most commonly implicated food (Centers for Disease Control 1999).

The long list of foods implicated in outbreaks of viral gastroenteritis reflects the variety of foods handled by food-service personnel and the low infectious dose (10–100 particles) of most viral agents of gastroenteritis. In contrast to the factors important in amplifying bacterial contamination, practices such as leaving foods unrefrigerated or warming them for prolonged periods are not direct risk factors for increased viral transmission because the viruses do not multiply outside the human host.

The Norwalk agent can remain infective even if frozen for years or heated to 60EC for 30 minutes. Cooking temperatures at 100EC or above are probably adequate to inactivate Norwalk and most other enteric viral pathogens.

Outbreaks of viral gastroenteritis have been associated with various sources of contaminated water, including municipal water, well water, stream water, commercial ice, lake water, and pool water (Centers for Disease Control 1999). Disinfection of municipal supplies may not be adequate to kill the Norwalk agent, which can remain highly infective despite 30-minute exposure to concentrations of chlorine as high as 6.25 milligrams per liter (mg/l) and levels of 10 mg/l (Centers for Disease Control 1999); this helps explain why this virus is predominant in waterborne disease outbreaks. Rotavirus, for which only one waterborne outbreak has been documented in the United States, is more sensitive to chlorine than the Norwalk agent.

Because rotaviruses can survive for several days on nonporous materials in conditions of low temperature and humidity, objects may contribute to their transmission. A recent study of a Norwalk viral outbreak on a cruise ship implicated toilets shared between staterooms as a risk factor for infection, suggesting that surfaces contaminated by Norwalk particles from spattered or aerosolized material may play a role in transmission of Norwalk-like viruses causing gastroenteritis.

Aerosolized rotavirus has also been observed to caused diarrheal illness in experimental mice. Studies are needed to address the efficacy of barrier precautions (e.g., face shields, respirators) in interrupting transmission of these agents (Centers for Disease Control 1999).

Contaminated hands (hands contaminated directly or through contact with contaminated surfaces) may be the most important means by which enteric viruses are transmitted; thus, any people involved with biosolids should avail themselves of handwashing with soap on a routine basis to control the spread of all enteric pathogens.

Nearly all the agents of viral gastroenteritis in humans have related strains that can cause diarrhea in animal species. These strains appear to be highly host-specific, however, and zoonotic transmission has not been documented as having an important role in human disease, either endemically or in outbreaks.

Acquired Immune Deficiency Syndrome (AIDS/HIV Virus)

No discussion of viruses would be complete without a discussion of acquired immune deficiency syndrome (AIDS), which is caused by HIV (human immunodeficiency virus). It is noteworthy that HIV has never been recovered from wastewater samples into which it has not been artificially introduced (Ansari et al. 1992, Casson et al. 1992, Moore 1993). Researchers have recovered viral nucleic acid fragments in wastewater but none in biosolids (Preston et al. 1991). However, the detection of nucleic acid sequences does not represent the presence of viable HIV. No intact HIV has been recovered from either raw sewage or biosolids. The CDC contends that wastewater treatment professionals, as well as members of the public who may contact wastewater or biosolids, are not at risk of contracting AIDS as a result of this contact (Centers for Disease Control 1999).

Parasitic Worms

Several parasitic intestinal worms are found in wastewater (Straub et al. 1993, ABT Associates 1993). These parasites are a potential hazard to the public health in general and to treatment plant and biosolids workers in particular. The beef tapeworm (*Taenia saginata*) can cause taeniasis if ingested with poorly cooked meat. Tapeworm eggs are detectable in biosolids, but there is no evidence that they have contributed to distribution of the disease except in one reported case discussed below.

Toxoplasmosis

Toxoplasmosis is a very rare disease that affects only unborn fetuses. The disease is derived from cat feces. As shown in Table E-15a, between 9 and 192 cases per year have been reported in California, one of which were in areas (Merced County) where biosolids are being extensively land applied. A majority of the cases were in Los Angeles County except for an outbreak in San Francisco in 1990 where 148 cases were reported that year. Incidence rates for this disease are very low as shown in Table E-15b.

[Note: draft EIR Table E-15 has been deleted and is being replaced by Tables E-15a and E-15b at the end of document.]

Roundworms

Ascariasis is caused by the presence of roundworms (*Ascaris lambricoides*) in the intestinal tract. The disease results from the ingestion of roundworm eggs, which survive for months to years in biosolids (Table 5-1 in Chapter 5) and were a primary focus of the EPA Part 503 regulation risk management practices. This disease occasionally occurs and is not a reportable disease in California.

Hookworms

Hookworm disease, rare in California but still present in the southeastern United States, is generally acquired when the larvae of *Necator americanus* enter through the bare skin, usually the feet. Infections also have occurred following ingestion of foods contaminated by wastewater. No cases of transmission related to biosolids land application have been reported. Symptoms include malnutrition, loss of energy, and anemia. This disease is rare and has not been reported in the past 6 years.

Tapeworms

There are two species of tapeworms (*Taenia saginata* [beef] and *T. solium* [pork]) that live in the intestinal tract, where they can cause abdominal pain, weight loss, and digestive disturbances (Straub et al. 1993). Humans serve as the definitive host for the adults, and the eggs, which are passed in feces, may not be completely destroyed by all sludge treatment processes (Feachem et al. 1983), thus leading to the potential for their application to land in biosolids. If cattle graze on this land and ingest viable larvae, the disease may be transmitted to cattle. Humans have to become infected from eating incompletely cooked meat containing the larval stage of the tapeworm. A single recorded case of beef tapeworm transmission through the fertilization of land with untreated sludge has been reported in the United States; this case was reported more than 20 years ago, however, before the development of the Part 503 regulations and the improvements in treatment mandated under the Clean Water Act (Hammerberg et al. 1978).

Tapeworm infections are relatively rare in California; a maximum of 46 cases per year have been reported when an outbreak of 27 cases was reported in Santa Clara County (Table E-16a). A single case was reported in Kern County in 1997. Incidence rates for this diseare are very low as shown in Table E-16b.

[Note: draft EIR Table E-16 has been deleted and is being replaced by Tables E-16a and E-16b at the end of document.]

Fungal Diseases

Fungal pathogens include several species that have been identified in biosolids, as listed below.

Fungal Species	Disease
Aspergillus fumigatus	Aspergillosis
Candida albicans	Candidiasis
Cryptococcus neoformans	Subacute chronic meningitis
Epidermophton spp. and *Trichophyton* spp.	Ringworm and athlete's foot
Trichosporon spp.	Infection of hair follicles
Phialophora spp.	Deep tissue infections

Most of these fungal species have been found associated with composting operations, where they are enhanced by the favorable conditions created (wood chips and heat).

Aspergillosis is illness caused by the *Aspergillus* fungus, which is found commonly growing on dead leaves, stored grain, compost piles, or other decaying vegetation. The fungus can cause illness in three ways: as an allergic reaction in people with asthma (pulmonary aspergillosis, allergic bronchopulmonary type); as a colonization in an old lung cavity that has healed from previous disease such as tuberculosis or in a lung abscess, where it produces a fungus ball called aspergilloma; and as an invasive infection with pneumonia that is spread to other parts of the body by the blood stream (pulmonary aspergillosis; invasive type). The invasive infection can affect the eye, causing blindness, and any other organ of the body, but especially the heart, lungs, brain, and kidneys. The third form occurs almost exclusively in people whose immune systems are suppressed by high doses of cortisone drugs, chemotherapy, or a disease that reduces the number of normal white blood cells. Those at risk include organ transplant recipients and people with cancer, AIDS, or leukemia (Rosenberg and Minimato 1996).

The A*spergillus* group of fungi is generally less prevalent than other fungal species, but it can be pathogenic to people under conditions of high exposure. Normal background levels of *Aspergillus fumigatus* outdoors rarely exceed 150 spores per cubic meter.

Composting facilities do represent sites where there occurs a massive culturing of *Aspergillus fumigatus* organisms in relatively small areas compared with most "natural" or background circumstances. Studies have found concentrations of *A. fumigatus* 10 times higher than background levels in active commercial composting facilities, but the concentrations fell off sharply within 500 feet of the operational site (Clark et al. 1983) If the nearest human receptor is beyond the point at which concentrations fall to background levels, no elevated exposure is occurring.

The use of bark or wood chips (e.g., as a bulking agent for sewage sludge composting) typically raises the onsite level of airborne *A. fumigatus* spores (Millner et al. 1977, 1980; Clark et al. 1983). In one study in Maryland, *A. fumigatus* levels in sewage sludge rose from 10^2 or 10^3 colony forming units per gram dry weight (CFU/gm dry wt) to 2.6 x 10^6 to 6.10 x 10^7 CFU/gm dry wt when mixed with wood chips that were stockpiled for various lengths of time. The increase appeared to be caused by wood chips being stored in moist piles that were allowed to generate heat (Millner et al. 1977).

Increased *A. fumigatus* spore concentrations have been observed also in screened compost; the concentrations may have been increased as a result of reinoculation by spores as compost passed through contaminated screens multiple times (Olver 1979); others have suggested that multiple screenings may break up spore clusters, causing more spores to be released.

Numerous researchers (Raper and Fennel 1965; Sinski 1975; Olver 1979; Epstein and Epstein 1985, 1989; Maritato et al. 1992; Epstein 1993) have presented persuasive arguments regarding the lack of health risk from *A. fumigatus* for certain outdoor workplace environments. In enclosed compost facilities without dust control, there is an elevated risk of worker exposure to spores. In a worst-case scenario, a respiratory model developed by Boutin et al. (1987) estimated that a completely unprotected worker shoveling mature compost at a highly contaminated site could inhale 25,000 to 30,000 viable spores per hour. However, elevated exposure is not automatically synonymous with an elevated health risk for compost workers (or neighboring communities). Epstein (1993) discusses several composting facilities in the United States in which health monitoring (physical examinations) of compost workers has been conducted; the results of the physical examinations did not reveal any illnesses directly associated with composting.

Many public health specialists, scientists, and engineers in North America and Europe believe that properly operated composting and co-composting operations present little health risk to normal compost facility employees and present a negligible risk or no risk to nearby residences (Millner et al. 1977, Clark et al. 1983, Epstein and Epstein 1985, Boutin et al. 1987, Maritato et al. 1992). Diaz et al. (1992) stated:

> The existence of hazard from the spores of *A. fumigatus* [at commercial composting facilities] is yet to be demonstrated. The infectivity of the spores is low. Consequently, any danger posed by it would be of significance only to the unusually susceptible individual. Nevertheless, use of respirators by workers and the siting of such facilities in areas remote from residential dwellings and areas where potentially sensitive receptors work of live is warranted as a prudent land use planning practice.

Reducing the dispersal of *A. fumigatus* spores appears to be the best way to reduce exposure and help protect the health of compost workers and the neighboring communities.

The following management practices can help reduce the dispersal of spores into the air during commercial aerobic composting operations (whether they involve windrows, aerated static piles, or the various types of in-vessel reactors— vertical, horizontal, or rotating drum):

- suitable siting, design, and construction (berms, vegetation, etc.) of composting facilities;
- implementation of facility operational practices such as dust suppression, modification of time of operation, etc.);
- engineering and administrative controls (enclosed cabs, use of amendment materials, health checks for workers); and
- use of personal protective equipment (respirators or protective masks).

The California Integrated Waste Management Board's current green waste composting regulations require a setback of at least 300 feet of the facility's active compost materials areas from any residence, school, or hospital, excluding onsite residences, unless a variance is granted from the local enforcement agency. More stringent requirements can be applied where there are sensitive receptors; high winds; or other factors related to health risks, such as the health status of the community potentially affected.

Pathogens of Emerging Concern

Research techniques continue to be developed for determining the pathogenic microorganisms responsible for human and animal disease outbreaks. New genetic techniques and electron microscopy have improved our ability to detect and identify pathogens, particularly new viruses. Because approximately 50% of all cases of gastroenteritis are of unknown origin, such research is vital to development of our understanding of disease and disease prevention.

This section describes the results of a literature review of recent outbreaks of disease (worldwide) undertaken to identify some of the emerging pathogens and their possible modes of transmission. Emerging pathogens are organisms responsible for new, reemerging or drug-resistant infections whose incidence in humans has increased within the past two decades or whose incidence threatens to increase in the near future. Included are such pathogens as *E.coli* O157:h7 and *Cyclospora* which have caused several outbreaks in California. The results of this search are summarized in Tables E-17 and E-18 for bacteria and viruses, respectively. Table E-19 provides information on parasites. None of these potential pathogens of concern have yet been identified with the use or handling of biosolids. Most outbreaks are associated with poor sanitation or food preparation and handling or drinking of contaminated water.

The patterns of incidence and pathways of spread for various pathogens are poorly understood. Epidemiological studies have revealed some interesting findings with regard to crytposporidiosis that show how incidence of disease and causative factors are difficult to identify: evaluation of health records and water treatment plant records revealed that outbreaks of cryptosporidiosis were occurring in Milwaukee for more than a year before the large documented outbreak in 1993 (when high runoff occurred, the water treatment plant turbidity levels became very high, and treatment levels declined) (Morris et al. 1998).

Table E-17. Bacterial Pathogens of Emerging Concern

Pathogen	Disease	Source	Environmental Sources	Outbreaks Reported	Literature
Aeromonas spp. (332 types)	Gastroenteritis	Pigs, chickens, ground beef, human feces, fish, milk, vegetables	Drinking water, fresh water, and wastewater	None from biosolids	Wadstrom and Ljungh 1991, Hanninen and Siitonen 1995
Pleisomonas shigelloides	Gastroenteritis	Seafoods	Contaminated seawater	None from biosolids	Wadstrom and Ljungh 1991
Hepatitis E	Hepatitis	Human feces	Sewage-contaminated water supply	None from biosolids; water related only.	Singh et al. 1998
Helicobacter sp.	Unknown	Wastewater, treated water, well water	Contaminated supplies	None from biosolids	Hulten et al. 1998
Salmonella enteritidis PT6	Salmonellosis	Eggs	Foodborne contamination	None from biosolids	Evans 1998, St. Louis et al. 1988, Mishu et al. 1994
Salmonella enteritidis PT4	Salmonellosis	Wastewater to mice to chickens	Treated secondary effluent discharged to surface water	None from biosolids	Kinde et al. 1996, Kinde et al. 1997

Table E-18. Viral Pathogens of Emerging Concern

Pathogen	Disease	Source	Environmental Sources	Outbreaks Reported	Literature
Adenoviruses 40 and 41	Gastroenteritis	Humans	Unknown	None from biosolids	Enriques et al. 1995
Human torovirus	Gastroenteritis and diarrhea	Children	Unknown	None from biosolids	Jamieson et al. 1998
Picobirnavirus	Diarrhea	Adults and children, chickens, rabbits	Unknown	None from biosolids	Cascio et al. 1996; Chandra 1997; Ludert et al. 1995; Gallimore et al. 1995a, 1995b
Coxsachieviruses (new serotypes)	Association with diabetes mellitus	Children	Fecal-oral contact	None from biosolids	Roivainen et al. 1998
Small round structured virus (SRSV)	Influenza	Infants, children, elderly	Unknown	None from biosolids	Dedman et al. 1998
Norwalk-like virus (calicivirus)	Unknown	Pigs	Unknown	None from biosolids	Sugieda et al. 1998
Swine HEV (hepatitis E virus in pigs)	Unknown	Pigs	Unknown	None from biosolids	Meng et al. 1998
Torovirus-like particles related to Berne virus, BEV, and Breda virus (BRV)	Gastroenteritis	Humans, horses, and cattle	Unknown	None from biosolids	Duckmanton et al. 1997

Table E-19. Other Parasitic Pathogens of Emerging Concern

Pathogen	Disease	Source	Environmental Sources	Outbreaks Reported	Literature
Mircrosporidia	Gastroenteritis	Unknown	Unknown	None from biosolids	Johnson and Gerba 1997
Crytosporidium (Genotypes 1 and 2)	Gastroenteritis and diarrhea	Cattle	Unknown, water supply, swimming pools	None from biosolids	Patel et al. 1998, Furtado et al. 1998

Parasitic Microsporidians

Microsporidia are protozoan parasites that can infect humans and cause chronic diarrhea; they are of particular concern because of their being found in patients with AIDS (Johnson and Gerba 1997). They have only recently been discovered (seven species discovered so far) and identified as potential human pathogens, and only recent research indicates that they can be measured in environmental samples (water and wastewater) (Dowd et al. 1998). They are similar to other protozoan parasites such as *Giardia* and *Cryptosporidium* because of their small size, ability to infect different mammals, and spread through the environment; these characteristics, combined with their ability to form spores resistant to heat inactivation and drying, make them a pathogen of emerging concern with a potential to be waterborne (Johnson and Gerba 1997).

Rotaviruses

Rotaviruses are small RNA viruses that have been found to be associated with gastroenteritis in humans and a wide range of animal species (De Leon and Gerba 1990). It has yet to be shown that animal rotaviruses are pathogenic for man; furthermore, there is no evidence for species cross-infection in nature (Conklin 1981). The human rotavirus has two serotypes. Rotavirus has been associated with as many as 50% of hospitalized cases of diarrheal illness in infants and young children (EOA 1995).

Rotavirus gastroenteritis occurs worldwide both in sporadic and epidemic outbreaks. The primary targets are infants and children, particularly in the 6- to 24-month age group. Cases in adults are relatively infrequent but have been reported, mainly in countries other than the United States (EOA 1995). The most common route of rotavirus transmission is the fecal-oral route, with person-to-person transmission being the most frequent. Most individuals have acquired antibodies to both serotypes of rotavirus by the age of 2 and are therefore protected from the disease as they grow older.

In the United States, rotavirus infections are responsible for 100,000 hospitalizations per year (EOA 1995).

Rotavirus has been isolated from untreated drinking water, treated drinking water, and various foods, but the occurrence of infections from these sources has been rare (De Leon and Gerba 1990). There have been only two occurrences in the United States and these have been traced to improperly treated water (EOA 1995). No cases have been attributed to biosolids.

Rotavirus is persistent in the environment and can survive for as long as 10 days in raw fresh water and as long as 64 days in municipal treated tap water (free chlorine = 0.05 mg/l) (EOA 1995). Rotavirus has been shown to survive more than 14 days in estuarine and heavily polluted fresh water (EOA 1995). Rotavirus can survive as long as 2 weeks on inanimate surfaces, the length of survival depending on relative humidity and temperature (EOA 1995). The length of survival of rotavirus, together with its low infectious dose, leads to concerns over its possible presence in biosolids (Table 5-2 in Chapter 5). No cases of infection have been attributed to biosolids, however.

Other Viruses

Research continues to reveal the presence of previously unknown viruses that may play an important role in the large number of gastroenteritis cases of unknown origin. Among the new discoveries about which little is known are the human toroviruses (Duckmanton et al. 1997, Koopmans et al. 1997, Jamieson et al. 1998), picobirnaviruses (Gallimore et al. 1995a, 1995b; Chandra 1997), coxsachieviruses, small round structured viruses (SRSV) (Dedman et al. 1998), caliciviruses, Norwalk-like viruses (Sugieda et al. 1998), hepatitis E virus (Meng et al. 1998), Berne and Breda virus (also of animal origin), and adenoviruses. Table E-18 summarizes information on these viruses, their potential sources, and their reporting in scientific literature. Little is known about their transmission, epidemiology, environmental fate, or presence in biosolids or wastewater. However, their reporting is noted here as an indication that new pathogens continue to be discovered and that constant assessment of existing management practices is needed to ensure that biosolids are not contributing to the spread of disease. To date, no evidence indicates that they are.

Picobirnaviruses are a novel group of viruses recently found in the feces of several species of vertebrates. They have been detected in the feces of humans suffering from cryptosporidiosis and, although they have not been associated with any outbreaks attributable to water or food, are a pathogen of emerging concern. The prevalence of picnovirus in those studied in the United Kingdom was found to be 9%-13% in a wide range of patients (ages 3 to more than 65) in those both with and without the symptom of gastroentiritis (Gallimore et al. 1995b). No outbreaks caused by these viruses have been reported in the United States.

Toroviruses alone or in combination with enteroaggregative *E. coli* may play a pathogenic role in acute and possibly persistent diarrhea in children. Further studies are warranted to determine the etiologic role of toroviruses in gastroenteritis.

Other Diseases

Bovine Spongiform Encephalopathy

Well-publicized news reports in 1996 suggested that consumption of beef from diseased cattle in Britain may have caused a fatal human brain disease (Floyd 1996, Pattison 1998). The condition in the British cattle, commonly referred to as “mad cow disease” in these reports, is a disease called bovine spongiform encephalopathy, or BSE. Cattle with BSE have a degenerative brain condition that develops slowly over a 2- to 8-year period. BSE is similar in its effects on the cattle brain to other spongiform encephalopathy (SE) diseases in the brains of other animals. These include Kuru and Creutzfeldt-Jacob disease (CJD) in humans, scrapie in sheep, transmissible mink encephalopathy (TME), chronic wasting disease of mule deer and elk, feline spongiform encephalopathy (FSE), and a few others. Experimental studies have demonstrated that animals can contract some of the SE diseases by ingesting nervous system tissues (brain, spinal cord, etc.) from affected animals. It is suspected (although there is still much debate) that the causative agent in the SE diseases may be a prion, or a filterable glycoprotein devoid of detectable nucleic acid that is resistant to typical means of sterilization (Pattison 1998). These agents have survived 3 years of burial in outside soil and heating to high temperatures. An unidentified virus is also theorized as a cause.

BSE was first seen and diagnosed in Britain in 1986. It may have arisen as a result of rendered sheep byproducts being fed to cattle as protein supplements. Some of these sheep may have been infected with scrapie, an SE disease that has been known for more than 200 years. The number of BSE cases increased to a peak of about 1,000 new cases per weak by January 1993 and then began to decrease. The epidemic may have worsened because initially it was possible for cattle that had been affected with BSE to be rendered into protein supplements for other cattle. The British government banned feeding of ruminant-derived animal proteins to other ruminants in 1989. Because of the 2- to 8-year “incubation” period of development of BSE, cases continued to occur after this ban went into effect. In any event, the number of cases has decreased significantly and continues to decrease as a result of regulatory interventions, such as the offal feeding ban, which is now effectively applied.

Muscle tissue and milk have not been demonstrated to transmit BSE, but brain and spinal cord tissue have. Therefore, steps taken in Britain to ensure that nervous tissues from cattle do not enter the human food supply should effectively prevent any transmission; it is unknown whether such transmission ever actually occurred. These steps also have been taken in the United States.

To prevent the possibility of BSE entering the country, in 1989 the United States banned imports of live cattle and zoo ruminants from the United Kingdom and any country with BSE; imports of sheep and goats from the United Kingdom had already been banned because of scrapie.

No case of BSE has been diagnosed in the United States, despite aggressive efforts on the part of the U.S. Department of Agriculture and other surveillance programs for BSE. Included in the search are examinations at the National Services Veterinary Laboratory of the brains of cattle diagnosed with nervous system disease (postmortem microscopic examination of brain tissue) and periodic examinations of all live cattle in the United States that came from the United Kingdom before the import ban was instituted.

No research has been conducted to measure the presence of prions in the environment and there are no known means of measurement. Gale (1998) assessed the likelihood of prions being a risk if water from an aquifer were contaminated by a cattle-rendering plant discharging effluent to the aquifer, and found the risk of infection to be in the range of 1 in 100 million to 1 in 1 billion. Because the disease is not present in the United States, such an analysis provides further assurance that this disease represents a minimal threat to public health.

Part 2. EPA Part 503 Risk Assessment for the Land Application of Sewage Sludge

The EPA conducted extensive risk assessments for application of sewage sludge onto agricultural land and nonagricultural land (i.e., forest land, reclamation !and, and public contact sites). These assessments, based on a number of different exposure pathways and various “worst-case” (highly exposed individual or HEI) exposure assumptions, formed the basis for the sewage sludge pollutant loading limits specified in Section 503.13 of 40 CFR Part 503 Standards for the Use or Disposal of Sewage Sludge and used as minimum requirements in the SWRCB General Order (GO). The risk assessments and all the calculations and assumptions used are described in detail in technical support documents (U. S. Environmental Protection Agency 1992, Volumes 1 and 2).

Risk assessments were conducted for 14 exposure pathways for agricultural land and 12 exposure pathways for nonagricultural land. Pathway 2, human toxicity from ingesting plants grown in the home garden, and pathway 11, human exposure through inhalation of particulates resuspended by tilling of sewage sludge, were not analyzed for nonagricultural application because these are not appropriate exposure scenarios for nonagricultural land. These pathways are described in Table E-20.

The EPA assembled a national peer review committee of 35 recognized academic, government, and private industry experts in the field of sludge application to land for 10 of the risk assessments (pathways 1-10). This committee critically evaluated the methodology and data used to assess risk as part of developing criteria for land application of potentially toxic chemicals in municipal sewage sludge. The EPA's Office of Water conducted the risk assessment for pathway 11. The risk assessments for pathways 12, 13, and 14 were conducted for the EPA by the consulting firm ABT Associates (ABT Associates 1993).

Charles Henry of the University of Washington conducted thc risk assessments for pathways 1 through 10 for nonagricultural land (except for pathway 2 for home gardening). Pathways 12, 13, and 14 are identical for agricultural and nonagricultural land, so ABT Associates' assessment of agricultural pathways 12, 13, and 14 was also used for the nonagricultural pathways (U.S. Environmental Protection Agency 1992).

In undertaking the assessments, the EPA relied on numerous assumptions and decisions regarding the data to be used and what the exposure evaluations were to be based on. It was decided to use the concept of the highly exposed individual (HEI) as a target organism to be protected by the limits on individual pollutants. Depending on the pathway of exposure, the HEI could be a human, plant, animal, or environmental end point, such as surface water or groundwater, and is assumed to remain for an extended period at or adjacent to the site where the maximum exposure occurs.

Table E-20. Environmental Pathways of Concern
Identified for Application of Sewage Sludge to Agricultural Land

Pathway	Description of Highly Exposed Individual
1. Sewage Sludge-Soil-Plant-Human	Human ingesting plants grown in sewage sludge-amended soil
2. Sewage Sludge-Soil-Plant-Human	Residential home gardener
3. Sewage Sludge-Human	Children ingesting sewage sludges
4. Sewage Sludge-Soil-Plant-Animal-Human	Farm households producing a major portion of the animal products they consume; it is assumed that the animals eat plants grown in soil amended with sewage sludge
5. Sewage Sludge-Soil-Animal-Human	Farm households consuming livestock that ingest sewage sludge while grazing
6. Sewage Sludge-Soil-Plant-Animal	Livestock ingesting crops grown on sewage sludge-amended soil
7. Sewage Sludge-Soil-Animal	Grazing livestock ingesting sewage sludge
8. Sewage Sludge-Soil-Plant	Plants grown in sewage sludge-amended soil

Pathway	Description of Highly Exposed Individual
9. Sewage Sludge-Soil-Soil Organism	Soil organisms living in sewage sludge-amended soil
10. Sewage Sludge-Soil-Soil Organism-Soil Organism Predator	Animals eating soil organisms living in sewage sludge-amended soil
11. Sewage Sludge-Soil-Airborne Dust-Human	Tractor operator exposed to dust while plowing large areas of sewage sludge-amended soil
12. Sewage Sludge-Soil-Surface Water-Human	Person who consumes 0.04 kg/day of fish and 2 liters/day of water.
13. Sewage Sludge-Soil-Air-Human	Human breathing volatile pollutants from sewage sludge
14. Sewage Sludge-Soil-Groundwater-Human	Human drinking water from wells contaminated with pollutants leaching from sewage sludge-amended soil to groundwater

The risk-based models developed for the Part 503 regulations were designed to limit potential exposure of an HEI. Originally, in the 1989 proposed Part 503 rule, the concept for "worst-case" exposure was based on the "most exposed individual" (MEI), but the EPA changed this to be consistent with a statement in the rule's legislative history that calls for protecting individuals and populations that are "highly exposed to reasonably anticipated adverse conditions". In developing Subpart B of the rule, the EPA used different HEIs in evaluating each pathway of potential exposure.

The details for each of the HEIs selected and the assumptions used in the various risk scenario calculations are all contained in the technical support documents, which are voluminous (U. S. Environmental Protection Agency 1992). Examples are given here to provide an illustration of the HEIs for both the agricultural and nonagricultural settings for pathway 1, which was designed to protect consumers who eat food grown in sewage sludge-amended soil. For agricultural land application, the HEI was assumed to live in a region where a relatively high percentage of the available cropland receives sludge applications. To approximate realistic conditions, it was assumed that the HEI eats a mix of crops from land on which sludge was applied and crops from land on which sludge was not applied rather than eating foods that were all grown on sludge-amended soils.

For nonagricultural settings for pathway 1, the HEI was a person who regularly harvests edible wild plants (i.e., berries and mushrooms) from forests or rangelands that have been amended with sewage sludge. This food was assumed to be preserved by drying, freezing, or canning and, hence, to be available for consumption throughout the year. It was also assumed that an individual could continue with this practice for a lifetime (70 years).

Pathway 2 evaluated the effects on home gardeners of consuming crops grown in residential home gardens amended with sewage sludge. The major difference between pathways 1 and 2 was the fraction of food assumed to be grown on sewage sludge-amended soil. The HEI for pathway 2 was the home gardener who produced and consumed potatoes, leafy vegetables, fresh legumes, root vegetables, garden fruits (e.g., tomatoes, eggplants), sweet corn, and grains.

The HEI for pathway 3 was a young person (less than 6 year of age) ingesting sewage sludge from storage piles or from the soil surface.

For pathway 4, the HEI was an individual consuming foraging animals that consumed feed crops or vegetation grown on sewage sludge-amended soils. The HEI was assumed to consume daily quantities of the various animal tissue foods and to be exposed to background levels of pollutants from sources other than sludge. For the agricultural setting, the affected animal foods evaluated were beef, beef liver, lamb, pork, poultry, dairy, and eggs. In the nonagricultural setting, the HEI was assumed to be a hunter who preserved meat (including liver) for consumption throughout the year. The animals were assumed to have been hunted in the forest and eaten were deer and elk (because of their size and greater possibility of impact on intake through consumption compared with other animals).

Pathway 5 involved the application of sewage sludge to the land; the direct ingestion of this sewage sludge by animals; and, finally, the consumption of contaminated animal tissue by humans. The HEI was assumed to consume various animal tissue foods and be exposed to a background intake of pollutants.

Pathway 6 evaluated animals that ingest plants grown on sewage sludge-amended soil. The HEI used for both the agricultural and nonagricultural settings is a highly sensitive herbivore that consumed plants grown on sewage sludge-amended soil. Background intake was taken into account by considering background concentration of pollutants in forage crops. In a forest application site, the HEI was two grazing domestic animals and small herbivorous mammals (deer mice) that lived their entire lives in a sewage sludge-amended area feeding on seeds and small plants close to the layer of soil amended with sewage sludge. In the agricultural setting, the HEI was a sheep.

The HEI for pathway 7 was an herbivorous animal incidentally consuming sewage sludge adhering to forage crops and/or sewage sludge on the soil surface. Background intake was considered to be from ingesting soil having background levels of pollutant. Because forest animals more typically browse rather than graze, the HEI for agricultural settings was used as a reasonable worst-case surrogate for the nonagricultural HEI.

Pathway 8 was the plant phytotoxicity pathway and assumed as the HEI a plant sensitive to the pollutants in sewage sludge. Sensitivity was determined through a literature search including information on nonagronomic species, which were shown to be no more sensitive than agronomic species. Because sensitivity was found to be the same for agronomic and nonagronomic species, the limits set for agricultural species also protect wild species found in nonagricultural settings.

The HEI for pathway 9 is a soil organism sensitive to the pollutants in sewage sludge, an earthworm. Because all soil organisms are wild species, the same HEI was used for the nonagricultural and agricultural settings.

Pathway 10 assumed that the HEI was a shrew mole that consumed soil organisms that have been feeding on sewage sludge-amended soil. Pathway 9 had the same HEI for both the nonagricultural and agricultural pathways.

The HEI for pathway 11, which was designed to protect humans from the effects of airborne dusts containing sewage sludge, was a tractor driver tilling a field. This pathway evaluated the impact of particles that have been resuspended by the driver's tilling of dewatered sewage sludge into the soil. This pathway applies only to the agricultural setting because plowing is not normally performed in nonagricultural settings such as forests.

Pathway 12, the soil erosion pathway, used as an HEI a human who consumed 2 liters per day of drinking water from surface water contaminated by soil eroded from a site where sewage sludge was land applied. This individual was assumed to ingest 0.04 kilograms per day of fish from surface waters contaminated by sewage sludge pollutants. The HEI was the same for agricultural and nonagricultural practices.

Pathway 13 had as an HEI a human who inhaled the vapors of any volatile pollutants that may be in the sewage sludge when it is applied to the land. The HEI was assumed to live on the downwind side of the site with no change in wind direction ever occurring (constant exposure). The same plume air contaminant dispersion model was used for both the agricultural and nonagricultural settings.

The HEI for pathway 14 for agricultural and nonagricultural settings was an individual who obtained drinking water from ground water located directly below a field to which sewage sludge has been applied. Consumption was assumed to be 2 liters per day for a lifetime.

All the exposure scenarios involving ingestions included what is referred to as an oral reference dose (RfD). The RfD of a pollutant is a threshold below which effects adverse to human health are unlikely to occur. The EPA has a computerized listing of these human health criteria in its Integrated Risk Information System (IRIS), which it uses for many different purposes in developing health protection standards based on the latest scientific information.

Another key assumption that can change the risk assumption calculations is the recommended dietary allowances (RDAs). These are defined as the levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons. Although RfDs were generally used to determine the concentrations of inorganic pollutants that are protective of human health, the RDA was used in the case of zinc and copper.

Part 3. Endocrine Disruptors

Introduction

A wide range of chemicals, including some in common, often unregulated, undisclosed use are now associated with effects on the health, reproduction, and behavior of animals. At present, many of the effects are nonspecific in terms of the link to a particular environmental chemical, but the trends in research on hormone-affecting diseases indicate that it is probable that endocrine disruptors are contributing to human diseases and dysfunction.

The EPA has been directed by Congress to look into the issue of endocrine disruptors, focusing first on transmission in drinking water. An interagency task force of national experts has been assembled and a research plan has been developed.

Compounds termed "endocrine disruptors" can include both natural compounds and synthetic chemicals. Some, called phytoestrogens, occur naturally in a variety of plants; animals have evolved mechanisms to metabolize these, and they therefore do not accumulate and have adverse effects. A number of compounds that act as synthetic estrogens are now produced either through industrial manufacture (pesticides) or as byproducts of such processes or burning (such as dioxins). Testing for estrogenic activity is conducted in the lab using cultures of breast cancer cells. It has been found that some chemicals can cause effects at levels of parts per trillion—levels at which most chemicals have never been tested.

Table E-21 lists a variety of suspected hormone disruptors, which are discussed below.

Table E-21. List of Known and Suspected Hormone Disruptors:
Pollutants with Widespread Distribution Reported to Have Reproductive and
Endocrine-Disrupting Effects

Persistent Organohalogens	Pesticides
Dioxins and furans	2,4,5-T
PCBs	2,4-D
PBBs	alachlor
Octachlorostyrene	aldicarb
Hexachlorobenzene	amitrole
Pentachlorophenol	atrazine

benomyl
beta-HCH
carbaryl
chlordane
cypermethrin
DBCP
DDT
DDT metabolites
dicofol
dieldrin
endosulfan
esfenvalerate
ethylparathion
fenvalerate
lindane
heptachlor
h-epoxide
kelthane
kepone
malathion
mancozeb
maneb
methomyl
methoxychlor
metiram
metribuzin
mirex
nitrofen
oxychlordane
permethrin
synthetic pyrethroids
toxaphene
transnonachlor
tributyltin oxide
trifluralin
vinclozolin
zineb
ziram

<u>Phenolic Compounds</u>
Penta- to Nonyl-Phenols
Bisphenol A

<u>Phthalates</u>
Di-ethylhexyl phthalate (DEHP)
Butyl benzyl phthalate (BBP)
Di-n-butyl phthalate (DBP)
Di-n-pentyl phthalate (DPP)Di-hexyl phthalate (DHP)
Di-propyl phthalate (DprP)
Dicyclohexyl phthalate (DCHP)
Diethyl phthalate (DEP)

<u>Other Organics</u>
Styrene dimers and trimers
Benzo(a)pyrene

<u>Heavy Metals</u>
Cadmium
Lead
Mercury

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Source: Natural Resources Defense Council Endocrine Disruptors Web Page (www.nroc.org/nrdc/nrdc/proreports.html).

Pesticides

Many pesticides have been found to be estrogenic. These include the herbicides 2,4-D and 2,4,-T and the boat-fouling paint additive tributyl tin, and the traditional pesticides used widely in the past, such as carbaryl, chlordane, DDT, lindane, malathion, parathion, aldicarb, DBCP, and synthetic pyrethroids. Exposure can occur during application, through consumption of contaminated produce and other foods, through contaminated drinking water, or even from house dust in agricultural areas. Production of DDT for use in the United States was banned in 1972. However, other countries, especially tropical countries such as Mexico, still use it for mosquito control to combat malaria. DDT and its metabolites bioaccumulate in wildlife, and humans can be exposed through the food chain.

Soaps, Shampoos, and Hair Colors

Many industrial and consumer products contain alkylphenol ethoxylates (APEs), which break down into alkylphenols such as nonylphenol, which has been found in sewage and rivers near outfalls. One of the main uses of these compounds is in liquid detergents. In Europe, these products have been replaced by the more expensive but much safer alcohol ethoxylates. Denmark based its phaseout of alkyphenol exthoxylate on research conducted in the United Kingdom, which found that its breakdown products, alkylphenols, caused male fish to take on female characteristics. Alkylphenols do not biodegrade easily and bioaccumulate and therefore may cause problems when sewage sludge is applied to land.

Plastics and Plasticizers

Plastics contain additives, such as phthalates, bisphenol-A, and nonylphenols, usually present as plasticizers to increase flexibility and durability. They can leach out into liquids and foods. Heating speeds up this leaching process, which is why microwaving of foods in plastic is discouraged. Estrogenic butyl benzyl phthalate is found in vinyl floor tiles, adhesives, and synthetic leathers. The related compound di-butyl phthalate is present in some food-contact papers. Bisphenol-A is a breakdown product of polycarbonate plastics, which are used in water bottles, baby bottles, and the linings of some food cans.

Polychlorinated Biphenyls (PCBs)

PCBs are a family of toxic industrial chemicals commercialized in 1929 by Monsanto. Although their production in the United States stopped in 1977, world production continued. PCBs are still present in the United States in electrical equipment and are frequently found at toxic waste sites and in contaminated sediments. A recent study confirmed that children exposed to low levels of PCBs in the womb because of their mother's fish consumption grow up with low IQs, poor reading comprehension, difficulty paying attention, and memory problems.

Dioxins

Chlorinated dioxins and dibenzofurans are byproducts of the chlorine bleaching of paper; the burning of chlorinated hydrocarbons such as pentachlorophenol, PCBs, and polyvinyl chloride; the incineration of municipal and medical wastes; and natural events, such as forest fires and volcanic eruptions. They often contaminate toxic wastes sites, especially where there have been fires. They bioaccumulate in fish and other wildlife, and the most common human route of exposure is through the food chain.

Spermicides

Many spermicides contain nonoxynol-9, a nonylphenol that kills sperm. This compound can be carried into the sewer system and hence into biosolids, although the concentrations are probably not measurable.

Preservatives

BHA, butylated hydroxyanisole, is added to foods such as breakfast cereal, or its packaging, to prevent the foods from becoming rancid.

Metals

Lead, methyl mercury, and cadmium can disrupt the endocrine system by causing problems in steroid production.

In addition, a number of other pollutants with widespread distribution in the environment are reported to bind to hormone receptors and therefore are suspected to have reproductive and endocrine-disrupting effects. These pollutants include the following:

- 2,4-dichlorophenol
- diethylhexyl adipate
- benzophenone
- N-butyl benzene
- 4-nitrotoluene

The compounds listed above are only suspected of being endocrine disruptors. All of these compounds have had wide uses in the past and are present in the environment, although only a few are likely to be found. Their presence in biosolids, soils, water, food, or animals is variable and depends on the historical use of the chemicals and the means of environmental distribution. At present, there is no evidence that their presence in biosolids would increase health risks.

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Personal Communications

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Table E-1a Reported Incidence of Enterotoxic E coli O157 in California (1992-1998)

Local Health Department	1992	1993	1994	1995	1996	1997	1998
ALAMEDA		3	12	11	16	14	28
AMADOR				3		2	
BERKELEY		1	3				1
BUTTE				2	1	6	1
CALAVERAS						2	2
COLUSA				1			
CONTRA COSTA			1		4	8	14
EL DORADO				2		1	3
FRESNO		1	6	10	4	3	4
GLENN			1			1	
HUMBOLDT			1		9	3	5
IMPERIAL							2
INYO			2				
KERN				1	2		3
KINGS					2	1	
LONG BEACH (City)				1	4	1	
LOS ANGELES		9	13	6	18	20	24
MADERA			1		1	3	1
MARIN			1	1	8	3	5
MENDOCINO			1		2	1	2
MERCED				1	1		4
MODOC		1					
MONO		1	1				
MONTEREY		2	1	1	3	2	2
NAPA					3	2	4
NEVADA				1	1	1	1
ORANGE		6	1	6	6	6	11
PASADENA (City)					2		
PLACER				3	3	4	3
PLUMAS					1		
RIVERSIDE		1	1	2		4	2
SACRAMENTO		2	7	10	18	8	16
SAN BENITO		1		1	3		
SAN BERNARDINO		2	2	2		5	1
SAN DIEGO	1	26	17	12	15	15	24
SAN FRANCISCO		4	4	2	5	1	12
SAN JOAQUIN		1	14	6	10	7	14
SAN LUIS OBISPO		3	5	5	2	4	2
SAN MATEO		1	7		5	11	19
SANTA BARBARA		2	2	8	3	3	6
SANTA CLARA		9	7	4	15	11	19
SANTA CRUZ			2	1	6	2	5
SHASTA						1	
SISKIYOU			1				1
SOLANO				1	1	3	2
SONOMA		1		3	5	4	9
STANISLAUS		3		4		8	5
TULARE				3	2	2	
TUOLUMNE						1	5
VENTURA			4			6	2
YOLO				4	1	1	
YUBA					4		
Grand Total	1	80	118	118	186	181	264

Table E-1b Reported Incidence of Enterotoxic E coli O157 in California (1992-1998)

	Disease Incidence/100,000 by Year						
Local Health Department	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	0.0	0.2	1.0	0.9	1.3	1.1	2.1
AMADOR	0.0	0.0	0.0	9.2	0.0	6.0	0.0
BERKELEY (City)	0.0	1.0	2.9	0.0	0.0	0.0	0.9
BUTTE	0.0	0.0	0.0	1.0	0.5	3.0	0.5
CALAVERAS	0.0	0.0	0.0	0.0	0.0	5.4	5.2
COLUSA	0.0	0.0	0.0	5.6	0.0	0.0	0.0
CONTRA COSTA	0.0	0.0	0.1	0.0	0.5	0.9	1.5
EL DORADO	0.0	0.0	0.0	1.4	0.0	0.7	2.0
FRESNO	0.0	0.1	0.8	1.3	0.5	0.4	0.5
GLENN	0.0	0.0	3.8	0.0	0.0	3.7	0.0
HUMBOLDT	0.0	0.0	0.8	0.0	7.2	2.4	4.0
IMPERIAL	0.0	0.0	0.0	0.0	0.0	0.0	1.4
INYO	0.0	0.0	10.8	0.0	0.0	0.0	0.0
KERN	0.0	0.0	0.0	0.2	0.3	0.0	0.5
KINGS	0.0	0.0	0.0	0.0	1.7	0.9	0.0
LONG BEACH (City)	0.0	0.0	0.0	0.2	0.9	0.2	0.0
LOS ANGELES	0.0	0.1	0.1	0.1	0.2	0.2	0.3
MADERA	0.0	0.0	1.0	0.0	0.9	2.7	0.9
MARIN	0.0	0.0	0.4	0.4	3.3	1.2	2.0
MENDOCINO	0.0	0.0	1.2	0.0	2.4	1.2	2.3
MERCED	0.0	0.0	0.0	0.5	0.5	0.0	2.0
MODOC	0.0	10.0	0.0	0.0	0.0	0.0	0.0
MONO	0.0	9.8	9.5	0.0	0.0	0.0	0.0
MONTEREY	0.0	0.5	0.3	0.3	0.8	0.5	0.5
NAPA	0.0	0.0	0.0	0.0	2.5	1.7	3.3
NEVADA	0.0	0.0	0.0	1.2	1.2	1.1	1.1
ORANGE	0.0	0.2	0.0	0.2	0.2	0.2	0.4
PASADENA (City)	0.0	0.0	0.0	0.0	1.5	0.0	0.0
PLACER	0.0	0.0	0.0	1.5	1.5	1.9	1.4
PLUMAS	0.0	0.0	0.0	0.0	4.9	0.0	0.0
RIVERSIDE	0.0	0.1	0.1	0.1	0.0	0.3	0.1
SACRAMENTO	0.0	0.2	0.6	0.9	1.6	0.7	1.4
SAN BENITO	0.0	2.5	0.0	2.4	6.9	0.0	0.0
SAN BERNARDINO	0.0	0.1	0.1	0.1	0.0	0.3	0.1
SAN DIEGO	0.04	1.0	0.6	0.5	0.6	0.5	0.9
SAN FRANCISCO	0.0	0.5	0.5	0.3	0.7	0.1	1.5
SAN JOAQUIN	0.0	0.2	2.7	1.2	1.9	1.3	2.6
SAN LUIS OBISPO	0.0	1.3	2.2	2.2	0.9	1.7	0.8
SAN MATEO	0.0	0.1	1.0	0.0	0.7	1.6	2.7
SANTA BARBARA	0.0	0.5	0.5	2.1	0.8	0.8	1.5
SANTA CLARA	0.0	0.6	0.4	0.3	0.9	0.7	1.1
SANTA CRUZ	0.0	0.0	0.8	0.4	2.5	0.8	2.0
SHASTA	0.0	0.0	0.0	0.0	0.0	0.6	0.0
SISKIYOU	0.0	0.0	2.2	0.0	0.0	0.0	2.3
SOLANO	0.0	0.0	0.0	0.3	0.3	0.8	0.5
SONOMA	0.0	0.2	0.0	0.7	1.2	0.9	2.1
STANISLAUS	0.0	0.7	0.0	1.0	0.0	1.9	1.2
TULARE	0.0	0.0	0.0	0.9	0.6	0.6	0.0
TUOLUMNE	0.0	0.0	0.0	0.0	0.0	1.9	9.5
VENTURA	0.0	0.0	0.6	0.0	0.0	0.8	0.3
YOLO	0.0	0.0	0.0	2.7	0.7	0.7	0.0
YUBA	0.0	0.0	0.0	0.0	6.5	0.0	0.0

Table E-2a Reported Incidence of Campylobacter in California (1990-1998)

Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	319	375	365	395	515	380	537	450	346
ALPINE				1				1	
AMADOR	5	4	8	2	15	6	12	6	13
BERKELEY	64	86	56	68	61	74	110	83	61
BUTTE	24	36	26	34	58	58	38	72	54
CALAVERAS	6	3	3	6	8	8	11	9	7
COLUSA	2				3	3	2	6	1
CONTRA COSTA	342	380	275	357	430	344	313	322	188
DEL NORTE	2	6	7	2	4	3	4	1	4
EL DORADO	9	6	10	8	11	10	15	12	10
FRESNO	101	183	184	186	199	231	181	182	225
GLENN	4	2	2	5	4	6	4	8	6
HUMBOLDT	20	26	29	57	48	47	36	38	32
IMPERIAL		3	1	3	25	20	19	19	23
INYO	6	9	8	3	6	4	6	2	5
KERN	52	106	132	86	101	131	164	150	173
KINGS	1	2	2	12	18	24	13	25	18
LAKE	3		5	4	4	4	11	4	3
LASSEN	2	6	1	1	4	3	4	2	2
LONG BEACH	79	84	89	73	61	56	93	92	67
LOS ANGELES	1193	1251	1432	1417	1350	1249	1752	1606	1236
MADERA	13	3	28	26	32	17	36	32	35
MARIN	66	237	214	135	138	186	167	128	71
MARIPOSA	1	3	3	1	4	2	3	1	1
MENDOCINO	17	11	14	20	12	32	26	30	21
MERCED	28	73	68	64	93	76	95	81	40
MODOC		1	2						3
MONO	2	2	1	3	11		3	1	
MONTEREY	93	107	79	95	100	83	94	85	67
NAPA	56	60	79	68	70	63	66	73	44
NEVADA	6	21	13	17	10	11	21	14	7
ORANGE	338	303	308	340	193	445	447	403	284
PASADENA	22	28	32	22	37	24	17	23	26
PLACER	29	32	43	51	35	21	39	60	37
PLUMAS	3	7	5	4	4	6	2	4	
RIVERSIDE	133	128	186	174	151	129	210	217	136
SACRAMENTO	256	375	240	147	254	106	86	137	156
SAN BENITO	4	9	10	15	21	18	18	7	9
SAN BERNARDINO	80	107	117	148	181	193	243	227	162
SAN DIEGO	444	471	547	566	881	715	697	540	465
SAN FRANCISCO	774	714	711	625	614	560	603	584	427
SAN JOAQUIN	246	255	225	228	213	202	233	212	156
SAN LUIS OBISPO	31	36	40	53	52	53	61	61	34
SAN MATEO	304	389	370	383	461	382	340	344	291
SANTA BARBARA	57	67	100	83	84	66	58	71	70
SANTA CLARA	392	435	473	561	578	500	431	420	327
SANTA CRUZ	52	53	28	109	100	91	100	108	73
SHASTA	24	11	12	18	39	22	9	18	20
SIERRA			2	2	3	1	1	2	1
SISKIYOU	7	8	8	14	15	11	13	2	7
SOLANO	69	86	93	109	128	98	110	104	74
SONOMA	98	102	152	227	171	147	170	165	137
STANISLAUS	88	93	92	119	166	137	143	143	158
SUTTER	12	12	8	14	19	18	19	13	13
TEHAMA	1	2	4	6	6	2	2	6	6
TRINITY		2		5	2	1	3		2
TULARE	66	51	59	61	101	96	115	99	96
TUOLUMNE	2	3	2	8	5	4	7	4	7
VENTURA	73	85	86	131	127	119	133	117	78
YOLO	52	39	43	44	40	48	64	41	63
YUBA	7	9	9	14	9	16	10	10	7
Grand Total	6196	6998	7141	7430	8085	7362	8220	7677	6085

Table E-2b Reported Incidence of Campylobacter in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	27.2	31.5	30.3	32.3	41.7	30.7	42.9	35.3	26.5
ALPINE	0.0	0.0	0.0	88.5	0.0	0.0	0.0	84.0	0.0
AMADOR	16.6	13.0	25.4	6.3	46.3	18.5	36.6	18.1	39.0
BERKELEY	62.3	83.3	53.7	65.3	58.5	70.8	105.1	78.1	56.4
BUTTE	13.2	19.5	13.8	17.9	30.1	29.8	19.4	36.5	27.1
CALAVERAS	18.8	9.1	8.7	17.0	22.2	21.9	29.8	24.3	18.4
COLUSA	12.3	0.0	0.0	0.0	17.1	16.9	11.1	32.6	5.4
CONTRA COSTA	42.6	46.6	33.2	42.3	50.2	39.8	35.9	36.3	20.7
DEL NORTE	8.5	23.8	26.4	7.4	14.6	10.9	14.5	3.6	14.2
EL DORADO	7.1	4.6	7.5	5.8	7.8	7.0	10.4	8.3	6.7
FRESNO	15.1	26.7	26.1	25.7	27.1	30.9	23.8	23.5	28.8
GLENN	16.1	7.9	7.8	19.3	15.3	22.8	15.0	29.9	22.3
HUMBOLDT	16.8	21.6	23.8	46.2	38.7	37.8	28.8	30.3	25.4
IMPERIAL	0.0	2.6	0.8	2.4	18.9	14.8	13.6	13.5	16.1
INYO	32.8	49.2	43.7	16.3	32.5	21.7	32.7	10.9	27.3
KERN	9.5	18.9	22.8	14.5	16.7	21.4	26.4	23.8	27.2
KINGS	1.0	1.9	1.9	10.9	16.1	21.1	11.3	21.4	14.9
LAKE	5.9	0.0	9.4	7.4	7.3	7.3	20.0	7.3	5.4
LASSEN	7.2	21.5	3.6	3.5	14.0	10.5	13.1	5.8	5.9
LONG BEACH	18.4	19.1	20.1	16.6	13.9	12.8	21.2	20.9	15.0
LOS ANGELES	14.4	14.9	16.8	16.4	15.5	14.3	19.9	18.1	13.7
MADERA	14.8	3.3	29.1	25.9	30.8	16.1	33.2	28.6	30.7
MARIN	28.7	102.2	91.4	57.2	58.2	78.1	69.8	53.0	29.1
MARIPOSA	7.0	20.3	19.8	6.4	25.3	12.6	18.9	6.3	6.3
MENDOCINO	21.2	13.5	17.0	24.1	14.4	38.1	30.8	35.1	24.4
MERCED	15.7	39.8	36.2	33.4	47.5	38.4	47.9	40.5	19.7
MODOC	0.0	10.2	20.3	0.0	0.0	0.0	0.0	0.0	30.1
MONO	20.1	19.9	10.0	29.3	104.3	0.0	28.4	9.5	0.0
MONTEREY	26.1	29.6	21.5	25.6	27.3	23.0	26.0	23.0	17.6
NAPA	50.6	53.5	69.5	59.0	60.1	53.8	55.7	60.8	36.1
NEVADA	7.6	26.1	15.8	20.3	11.8	12.8	24.2	16.0	7.8
ORANGE	14.0	12.4	12.4	13.4	7.5	17.1	17.0	15.1	10.4
PASADENA	16.7	21.1	24.0	16.3	27.3	17.6	12.4	16.6	18.5
PLACER	16.8	17.9	23.4	26.9	18.0	10.5	18.9	28.2	16.9
PLUMAS	15.2	35.3	24.7	19.5	19.4	29.3	9.8	19.7	0.0
RIVERSIDE	11.4	10.5	14.7	13.3	11.3	9.5	15.2	15.5	9.4
SACRAMENTO	24.6	35.2	22.1	13.4	22.9	9.5	7.6	12.0	13.5
SAN BENITO	10.9	24.1	26.2	38.1	51.9	43.1	41.5	15.5	19.2
SAN BERNARDINO	5.6	7.3	7.8	9.6	11.6	12.3	15.3	14.1	9.9
SAN DIEGO	17.8	18.5	21.2	21.7	33.4	26.9	26.0	19.8	16.6
SAN FRANCISCO	106.9	97.7	96.7	83.9	81.6	74.5	79.4	75.6	54.5
SAN JOAQUIN	51.2	52.0	45.0	45.0	41.5	38.9	44.1	39.4	28.5
SAN LUIS OBISPO	14.3	16.4	18.1	23.8	23.1	23.3	26.6	26.2	14.4
SAN MATEO	46.8	59.3	55.7	57.0	67.9	55.7	49.0	48.8	40.6
SANTA BARBARA	15.4	17.9	26.4	21.7	21.8	17.0	14.8	17.9	17.4
SANTA CLARA	26.2	28.7	30.8	36.0	36.5	31.4	26.6	25.4	19.4
SANTA CRUZ	22.6	22.9	12.0	46.2	42.1	37.9	41.2	44.0	29.3
SHASTA	16.3	7.3	7.7	11.4	24.5	13.7	5.6	11.1	12.2
SIERRA	0.0	0.0	60.6	60.2	89.6	29.7	29.6	59.5	29.9
SISKIYOU	16.1	18.3	18.3	31.7	33.7	24.6	29.3	4.5	15.8
SOLANO	20.3	24.5	25.9	29.9	34.7	26.5	29.6	27.7	19.4
SONOMA	25.2	25.9	37.9	55.7	41.4	35.3	40.3	38.5	31.4
STANISLAUS	23.8	24.3	23.5	29.7	40.8	33.3	34.4	33.9	36.9
SUTTER	18.6	18.1	11.7	20.0	26.5	24.7	25.6	17.2	17.0
TEHAMA	2.0	4.0	7.7	11.4	11.3	3.7	3.7	11.0	10.9
TRINITY	0.0	15.3	0.0	37.9	15.0	7.5	22.4	0.0	15.2
TULARE	21.2	16.0	18.0	18.2	29.6	27.7	32.7	27.8	26.7
TUOLUMNE	4.1	6.1	4.0	15.7	9.7	7.7	13.6	7.7	13.3
VENTURA	10.9	12.6	12.6	18.9	18.1	16.8	18.6	16.2	10.6
YOLO	36.8	27.2	29.6	30.0	27.1	32.1	42.2	26.7	40.5
YUBA	12.0	15.1	14.9	22.8	14.6	25.8	16.3	16.4	11.5

Table E-3a Reported Incidence of Salmonellosis in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	254	189	250	234	200	225	280	250	208
ALPINE			1						
AMADOR	5	4	1	3	3	4	3	3	7
BERKELEY	20	15	28	17	15	20	33	23	15
BUTTE	36	24	36	29	32	35	28	23	16
CALAVERAS	3	1	2	2	3	1	5	6	5
COLUSA	1	1	1	1	1	2	3	1	1
CONTRA COSTA	182	124	96	162	124	135	111	148	109
DEL NORTE		5	7	6	3		2	3	1
EL DORADO	17	9	12	14	13	16	30	17	20
FRESNO	66	132	94	81	135	91	103	119	97
GLENN	7	2	4	2	1	6	6	6	1
HUMBOLDT	10	25	19	27	16	13	14	9	12
IMPERIAL	46	38	36	60	48	24	40	34	31
INYO	5	7	9	3	15	9	6	6	
KERN	76	68	79	88	96	93	136	69	102
KINGS	9	13	6	25	10	14	17	14	5
LAKE	6	4	6	4	2	14	11	7	6
LASSEN	4	11	6	3	2		4	4	2
LONG BEACH	100	71	88	89	107	107	104	102	82
LOS ANGELES	1607	1555	1681	1583	2140	2007	1774	1699	1406
MADERA	9	13	22	29	28	24	22	19	14
MARIN	43	30	59	31	33	36	35	50	44
MARIPOSA		3	1	1	5	5	3	1	
MENDOCINO	5	9	13	15	14	5	10	9	9
MERCED	28	19	33	44	31	69	44	44	41
MODOC	1	1		1	3	1	1	1	
MONO				5	8	4	16	4	
MONTEREY	45	40	45	47	39	48	72	46	39
NAPA	20	12	15	23	21	31	24	17	10
NEVADA	13	15	12	14	10	8	22	11	11
ORANGE	369	316	388	412	277	625	555	551	334
PASADENA	41	34	42	36	49	33	35	36	22
PLACER	25	19	36	32	28	16	49	31	54
PLUMAS	1	2	8	6	5	4	7	2	2
RIVERSIDE	183	185	215	213	289	265	229	205	166
SACRAMENTO	247	205	213	193	121	114	180	126	135
SAN BENITO	10	7	4	3	11	6	7	8	8
SAN BERNARDINO	186	184	228	266	418	361	279	247	145
SAN DIEGO	450	584	540	492	539	570	620	574	424
SAN FRANCISCO	215	181	218	200	199	193	184	216	186
SAN JOAQUIN	144	90	99	112	105	66	90	70	84
SAN LUIS OBISPO	36	23	22	27	28	45	43	35	33
SAN MATEO	187	151	169	150	132	140	167	208	102
SANTA BARBARA	65	69	79	48	47	80	87	62	59
SANTA CLARA	372	288	307	391	273	352	484	372	282
SANTA CRUZ	38	34	58	45	50	44	60	57	37
SHASTA	17	18	21	25	12	8	6	14	6
SIERRA				3				1	
SISKIYOU	6	5	5	5	12	2		6	4
SOLANO	69	32	49	71	31	52	63	43	47
SONOMA	57	54	59	77	52	52	64	71	56
STANISLAUS	100	61	63	52	62	68	95	129	58
SUTTER	7	16	13	7	10	8	15	7	8
TEHAMA	4	7	2	6	7	2	5	7	3
TRINITY	1	1	2		5	2		1	
TULARE	55	67	70	66	183	83	68	66	64
TUOLUMNE	8	4	4	11	3	3	11	6	5
VENTURA	84	75	98	75	93	106	156	81	109
YOLO	15	25	21	25	17	6	14	11	8
YUBA	6	4	10	5	10	3	12	5	4
Grand Total	5616	5181	5705	5697	6226	6356	6544	5993	4739

Table E-3b Reported Incidence of Salmonellosis in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	21.6	15.9	20.7	19.1	16.2	18.1	22.4	19.6	15.9
ALPINE	0.0	0.0	88.5	0.0	0.0	0.0	0.0	0.0	0.0
AMADOR	16.6	13.0	3.2	9.4	9.3	12.3	9.2	9.0	21.0
BERKELEY	19.5	14.5	26.9	16.3	14.4	19.1	31.5	21.6	13.9
BUTTE	19.8	13.0	19.2	15.2	16.6	18.0	14.3	11.6	8.0
CALAVERAS	9.4	3.0	5.8	5.7	8.3	2.7	13.5	16.2	13.1
COLUSA	6.1	6.0	5.9	5.8	5.7	11.3	16.6	5.4	5.4
CONTRA COSTA	22.6	15.2	11.6	19.2	14.5	15.6	12.7	16.7	12.0
DEL NORTE	0.0	19.8	26.4	22.2	10.9	0.0	7.3	10.7	3.6
EL DORADO	13.5	6.9	8.9	10.2	9.2	11.2	20.8	11.8	13.4
FRESNO	9.9	19.2	13.3	11.2	18.4	12.2	13.5	15.4	12.4
GLENN	28.2	7.9	15.6	7.7	3.8	22.8	22.5	22.4	3.7
HUMBOLDT	8.4	20.7	15.6	21.9	12.9	10.5	11.2	7.2	9.5
IMPERIAL	42.1	33.5	30.2	47.5	36.3	17.7	28.7	24.1	21.7
INYO	27.4	38.3	49.2	16.3	81.3	48.8	32.7	32.8	0.0
KERN	13.9	12.1	13.6	14.8	15.9	15.2	21.9	11.0	16.0
KINGS	8.9	12.5	5.6	22.8	8.9	12.3	14.7	12.0	4.1
LAKE	11.9	7.7	11.3	7.4	3.7	25.5	20.0	12.7	10.9
LASSEN	14.5	39.5	21.3	10.5	7.0	0.0	13.1	11.6	5.9
LONG BEACH	23.3	16.2	19.9	20.2	24.4	24.5	23.7	23.1	18.4
LOS ANGELES	19.4	18.5	19.8	18.3	24.6	22.9	20.2	19.1	15.6
MADERA	10.2	14.1	22.9	28.9	27.0	22.7	20.3	17.0	12.3
MARIN	18.7	12.9	25.2	13.1	13.9	15.1	14.6	20.7	18.0
MARIPOSA	0.0	20.3	6.6	6.4	31.6	31.5	18.9	6.3	0.0
MENDOCINO	6.2	11.0	15.8	18.1	16.7	6.0	11.8	10.5	10.5
MERCED	15.7	10.4	17.5	22.9	15.8	34.9	22.2	22.0	20.2
MODOC	10.3	10.2	0.0	10.0	29.9	10.0	10.0	9.9	0.0
MONO	0.0	0.0	0.0	48.8	75.8	37.7	151.7	38.1	0.0
MONTEREY	12.7	11.1	12.3	12.7	10.6	13.3	19.9	12.5	10.2
NAPA	18.1	10.7	13.2	19.9	18.0	26.5	20.3	14.2	8.2
NEVADA	16.6	18.7	14.6	16.7	11.8	9.3	25.3	12.5	12.3
ORANGE	15.3	12.9	15.6	16.3	10.8	24.1	21.1	20.6	12.2
PASADENA	31.2	25.7	31.4	26.7	36.2	24.2	25.5	26.0	15.7
PLACER	14.5	10.7	19.6	16.9	14.4	8.0	23.8	14.6	24.6
PLUMAS	5.1	10.1	39.5	29.2	24.3	19.5	34.3	9.8	9.8
RIVERSIDE	15.6	15.1	16.9	16.3	21.7	19.5	16.6	14.6	11.5
SACRAMENTO	23.7	19.3	19.6	17.5	10.9	10.2	16.0	11.1	11.7
SAN BENITO	27.3	18.7	10.5	7.6	27.2	14.4	16.1	17.8	17.0
SAN BERNARDINO	13.1	12.6	15.1	17.3	26.8	23.0	17.6	15.4	8.9
SAN DIEGO	18.0	23.0	20.9	18.8	20.4	21.4	23.1	21.0	15.2
SAN FRANCISCO	29.7	24.8	29.6	26.9	26.5	25.7	24.2	28.0	23.7
SAN JOAQUIN	30.0	18.4	19.8	22.1	20.5	12.7	17.0	13.0	15.4
SAN LUIS OBISPO	16.6	10.5	10.0	12.1	12.4	19.8	18.7	15.0	14.0
SAN MATEO	28.8	23.0	25.4	22.3	19.4	20.4	24.1	29.5	14.2
SANTA BARBARA	17.6	18.4	20.8	12.6	12.2	20.6	22.2	15.6	14.6
SANTA CLARA	24.8	19.0	20.0	25.1	17.3	22.1	29.9	22.5	16.7
SANTA CRUZ	16.5	14.7	24.8	19.1	21.0	18.3	24.7	23.2	14.9
SHASTA	11.6	11.9	13.5	15.9	7.5	5.0	3.7	8.6	3.7
SIERRA	0.0	0.0	0.0	90.4	0.0	0.0	0.0	29.8	0.0
SISKIYOU	13.8	11.4	11.4	11.3	26.9	4.5	0.0	13.6	9.0
SOLANO	20.3	9.1	13.7	19.5	8.4	14.0	17.0	11.5	12.3
SONOMA	14.7	13.7	14.7	18.9	12.6	12.5	15.2	16.6	12.8
STANISLAUS	27.0	16.0	16.1	13.0	15.2	16.5	22.8	30.6	13.5
SUTTER	10.9	24.2	19.1	10.0	13.9	11.0	20.2	9.3	10.5
TEHAMA	8.1	13.8	3.9	11.4	13.2	3.7	9.2	12.8	5.5
TRINITY	7.7	7.7	15.3	0.0	37.5	14.9	0.0	7.5	0.0
TULARE	17.6	21.0	21.3	19.7	53.7	24.0	19.3	18.5	17.8
TUOLUMNE	16.5	8.1	8.0	21.5	5.8	5.8	21.3	11.6	9.5
VENTURA	12.6	11.1	14.3	10.8	13.2	14.9	21.9	11.2	14.9
YOLO	10.6	17.5	14.4	17.0	11.5	4.0	9.2	7.2	5.1
YUBA	10.3	6.7	16.5	8.1	16.2	4.8	19.5	8.2	6.6

Table E-4a Reported Incidence of Shigellosis Type A in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	8	2	4	5	1	3	3	10	2
BUTTE					2	1			
COLUSA		1							
CONTRA COSTA	3		1		1			1	
EL DORADO						2			
FRESNO		3	1	6	6	1			
IMPERIAL		1				1			
KERN	2		1	2					
KINGS		2			1	2			
LASSEN							1		1
LONG BEACH	5		1	1		1	1		
LOS ANGELES	32	22	21	14	10	9	16	2	5
MADERA			1	1		1			
MARIN	1						1		4
MERCED	1		1				2		
MODOC								1	
MONTEREY	1			1	1			2	
NAPA	1	1							
ORANGE	9	13	7	8	3	3	3	4	2
PASADENA	1	1			1	1			
PLACER	1								1
RIVERSIDE	3	2	6	1	1	1	1	1	1
SACRAMENTO	1			1	1		1	1	
SAN BENITO					3	2			
SAN BERNARDINO	3	4	1	1	3	3	1		1
SAN DIEGO	11	11	6	10	6	9	3	1	1
SAN FRANCISCO	3	1	3	2	3	2	3	2	
SAN JOAQUIN	2	2	1	1	1				1
SAN LUIS OBISPO			1		1				
SAN MATEO	1	3	2	1	3	1			
SANTA BARBARA				2		1	1		
SANTA CLARA	4	3	6	3	3	4		2	2
SANTA CRUZ	3		1		1		1		
SHASTA							1		
SOLANO	4	1	1						1
SONOMA	3						1		1
STANISLAUS	1		3	1					
SUTTER		1					1		
TEHAMA			1						
TULARE	3	1	1			1			1
VENTURA	3	2	1		2	1			
Grand Total	110	77	72	61	54	50	41	27	24

Table E-4b Reported Incidence of Shigellosis Type A in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	0.7	0.2	0.3	0.4	0.1	0.2	0.2	0.8	0.2
BUTTE	0.0	0.0	0.0	0.0	1.0	0.5	0.0	0.0	0.0
COLUSA	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONTRA COSTA	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0
EL DORADO	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0
FRESNO	0.0	0.4	0.1	0.8	0.8	0.1	0.0	0.0	0.0
IMPERIAL	0.0	0.9	0.0	0.0	0.0	0.7	0.0	0.0	0.0
KERN	0.4	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0
KINGS	0.0	1.9	0.0	0.0	0.9	1.8	0.0	0.0	0.0
LASSEN	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	3.0
LONG BEACH	1.2	0.0	0.2	0.2	0.0	0.2	0.2	0.0	0.0
LOS ANGELES	0.4	0.3	0.2	0.2	0.1	0.1	0.2	0.0	0.1
MADERA	0.0	0.0	1.0	1.0	0.0	0.9	0.0	0.0	0.0
MARIN	0.4	0.0	0.0	0.0	0.0	0.0	0.4	0.0	1.6
MERCED	0.6	0.0	0.5	0.0	0.0	0.0	1.0	0.0	0.0
MODOC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	0.0
MONTEREY	0.3	0.0	0.0	0.3	0.3	0.0	0.0	0.5	0.0
NAPA	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ORANGE	0.4	0.5	0.3	0.3	0.1	0.1	0.1	0.1	0.1
PASADENA	0.8	0.8	0.0	0.0	0.7	0.7	0.0	0.0	0.0
PLACER	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
RIVERSIDE	0.3	0.2	0.5	0.1	0.1	0.1	0.1	0.1	0.1
SACRAMENTO	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
SAN BENITO	0.0	0.0	0.0	0.0	7.4	4.8	0.0	0.0	0.0
SAN BERNARDINO	0.2	0.3	0.1	0.1	0.2	0.2	0.1	0.0	0.1
SAN DIEGO	0.4	0.4	0.2	0.4	0.2	0.3	0.1	0.0	0.0
SAN FRANCISCO	0.4	0.1	0.4	0.3	0.4	0.3	0.4	0.3	0.0
SAN JOAQUIN	0.4	0.4	0.2	0.2	0.2	0.0	0.0	0.0	0.2
SAN LUIS OBISPO	0.0	0.0	0.5	0.0	0.4	0.0	0.0	0.0	0.0
SAN MATEO	0.2	0.5	0.3	0.1	0.4	0.1	0.0	0.0	0.0
SANTA BARBARA	0.0	0.0	0.0	0.5	0.0	0.3	0.3	0.0	0.0
SANTA CLARA	0.3	0.2	0.4	0.2	0.2	0.3	0.0	0.1	0.1
SANTA CRUZ	1.3	0.0	0.4	0.0	0.4	0.0	0.4	0.0	0.0
SHASTA	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
SOLANO	1.2	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3
SONOMA	0.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
STANISLAUS	0.3	0.0	0.8	0.2	0.0	0.0	0.0	0.0	0.0
SUTTER	0.0	1.5	0.0	0.0	0.0	0.0	1.3	0.0	0.0
TEHAMA	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0
TULARE	1.0	0.3	0.3	0.0	0.0	0.3	0.0	0.0	0.3
VENTURA	0.4	0.3	0.1	0.0	0.3	0.1	0.0	0.0	0.0

Table E-5a Reported Incidence of Shigellosis Type B in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	44	42	33	27	26	23	27	59	28
ALPINE					1				
AMADOR				1					
BERKELEY	6	6	1	4	4	3	2	1	1
BUTTE	1	2	1			1	2		
COLUSA					1		1	3	1
CONTRA COSTA	18	3	7	15	15	9	14	15	8
EL DORADO						1			
FRESNO	40	22	29	27	42	36	25	22	16
GLENN	3	4	3						
HUMBOLDT			1	1	1			2	
IMPERIAL	10		4	5	8	4	7	1	1
INYO	3			1			1		
KERN	12	16	10	6	6	4	5	2	
KINGS	1		5	4	5	1		1	
LAKE					1				
LONG BEACH	32	24	39	36	46	28	29	26	19
LOS ANGELES	686	685	704	526	516	470	390	313	234
MADERA	2	11	12	10	4	11	12		1
MARIN	14	7	4	6	2	3	5	8	6
MARIPOSA						1			
MENDOCINO			2	1			1	4	2
MERCED	2		4	2	1	1	2	1	2
MODOC	1				1				
MONO					1	1	1		1
MONTEREY	26	42	25	11	14	13	11	9	6
NAPA	4	8		4	4	2	5	4	9
NEVADA	1							1	
ORANGE	153	132	133	135	90	127	124	70	61
PASADENA	7	7	12	4	9	5	6	6	4
PLACER	3	1	2	3	3	1	1		2
PLUMAS		1	3						
RIVERSIDE	44	43	53	54	41	43	29	16	40
SACRAMENTO	26	19	20	11	8	4	11	11	14
SAN BENITO	2		2	2	5	4	10	2	3
SAN BERNARDINO	67	73	46	44	68	38	48	22	19
SAN DIEGO	202	153	138	155	139	154	161	139	67
SAN FRANCISCO	221	140	149	129	127	96	88	111	73
SAN JOAQUIN	46	43	30	15	20	31	31	16	18
SAN LUIS OBISPO	2	4	4	4	4	1	2	5	2
SAN MATEO	51	41	32	22	27	21	16	20	34
SANTA BARBARA	24	19	18	18	10	17	17	16	14
SANTA CLARA	65	66	68	66	61	50	39	42	35
SANTA CRUZ	17	3	17	9	18	5	3	10	3
SHASTA	5	2	1	1	1				
SOLANO	19	10	6	6	2	4	3	11	3
SONOMA	12	11	9	4	10	5	6	7	11
STANISLAUS	17	12	13	18	6	11	15	7	14
SUTTER	5	3	4	3	3	2	2	2	1
TEHAMA			1	1					
TULARE	35	19	42	29	32	23	4	3	7
VENTURA	25	19	12	13	10	17	10	12	8
YOLO	3	1	2		1				2
YUBA		3	1	2	3				
Grand Total	1957	1697	1702	1435	1397	1271	1166	1000	770

Table E-5b Reported Incidence of Shigellosis Type B in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	3.7	3.5	2.7	2.2	2.1	1.9	2.2	4.6	2.1
ALPINE	0.0	0.0	0.0	0.0	88.5	0.0	0.0	0.0	0.0
AMADOR	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0
BERKELEY	5.8	5.8	1.0	3.8	3.8	2.9	1.9	0.9	0.9
BUTTE	0.5	1.1	0.5	0.0	0.0	0.5	1.0	0.0	0.0
COLUSA	0.0	0.0	0.0	0.0	5.7	0.0	5.5	16.3	5.4
CONTRA COSTA	2.2	0.4	0.8	1.8	1.8	1.0	1.6	1.7	0.9
EL DORADO	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0
FRESNO	6.0	3.2	4.1	3.7	5.7	4.8	3.3	2.8	2.0
GLENN	12.1	15.9	11.7	0.0	0.0	0.0	0.0	0.0	0.0
HUMBOLDT	0.0	0.0	0.8	0.8	0.8	0.0	0.0	1.6	0.0
IMPERIAL	9.1	0.0	3.4	4.0	6.1	3.0	5.0	0.7	0.7
INYO	16.4	0.0	0.0	5.4	0.0	0.0	5.4	0.0	0.0
KERN	2.2	2.9	1.7	1.0	1.0	0.7	0.8	0.3	0.0
KINGS	1.0	0.0	4.7	3.6	4.5	0.9	0.0	0.9	0.0
LAKE	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0
LONG BEACH	7.5	5.5	8.8	8.2	10.5	6.4	6.6	5.9	4.3
LOS ANGELES	8.3	8.1	8.3	6.1	5.9	5.4	4.4	3.5	2.6
MADERA	2.3	12.0	12.5	10.0	3.9	10.4	11.1	0.0	0.9
MARIN	6.1	3.0	1.7	2.5	0.8	1.3	2.1	3.3	2.5
MARIPOSA	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0
MENDOCINO	0.0	0.0	2.4	1.2	0.0	0.0	1.2	4.7	2.3
MERCED	1.1	0.0	2.1	1.0	0.5	0.5	1.0	0.5	1.0
MODOC	10.3	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
MONO	0.0	0.0	0.0	0.0	9.5	9.4	9.5	0.0	9.5
MONTEREY	7.3	11.6	6.8	3.0	3.8	3.6	3.0	2.4	1.6
NAPA	3.6	7.1	0.0	3.5	3.4	1.7	4.2	3.3	7.4
NEVADA	1.3	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
ORANGE	6.3	5.4	5.3	5.3	3.5	4.9	4.7	2.6	2.2
PASADENA	5.3	5.3	9.0	3.0	6.6	3.7	4.4	4.3	2.9
PLACER	1.7	0.6	1.1	1.6	1.5	0.5	0.5	0.0	0.9
PLUMAS	0.0	5.0	14.8	0.0	0.0	0.0	0.0	0.0	0.0
RIVERSIDE	3.8	3.5	4.2	4.1	3.1	3.2	2.1	1.1	2.8
SACRAMENTO	2.5	1.8	1.8	1.0	0.7	0.4	1.0	1.0	1.2
SAN BENITO	5.5	0.0	5.2	5.1	12.3	9.6	23.1	4.4	6.4
SAN BERNARDINO	4.7	5.0	3.0	2.9	4.4	2.4	3.0	1.4	1.2
SAN DIEGO	8.1	6.0	5.3	5.9	5.3	5.8	6.0	5.1	2.4
SAN FRANCISCO	30.5	19.1	20.3	17.3	16.9	12.8	11.6	14.4	9.3
SAN JOAQUIN	9.6	8.8	6.0	3.0	3.9	6.0	5.9	3.0	3.3
SAN LUIS OBISPO	0.9	1.8	1.8	1.8	1.8	0.4	0.9	2.1	0.8
SAN MATEO	7.9	6.2	4.8	3.3	4.0	3.1	2.3	2.8	4.7
SANTA BARBARA	6.5	5.1	4.7	4.7	2.6	4.4	4.3	4.0	3.5
SANTA CLARA	4.3	4.4	4.4	4.2	3.9	3.1	2.4	2.5	2.1
SANTA CRUZ	7.4	1.3	7.3	3.8	7.6	2.1	1.2	4.1	1.2
SHASTA	3.4	1.3	0.6	0.6	0.6	0.0	0.0	0.0	0.0
SOLANO	5.6	2.9	1.7	1.6	0.5	1.1	0.8	2.9	0.8
SONOMA	3.1	2.8	2.2	1.0	2.4	1.2	1.4	1.6	2.5
STANISLAUS	4.6	3.1	3.3	4.5	1.5	2.7	3.6	1.7	3.3
SUTTER	7.8	4.5	5.9	4.3	4.2	2.7	2.7	2.7	1.3
TEHAMA	0.0	0.0	1.9	1.9	0.0	0.0	0.0	0.0	0.0
TULARE	11.2	5.9	12.8	8.7	9.4	6.6	1.1	0.8	1.9
VENTURA	3.7	2.8	1.8	1.9	1.4	2.4	1.4	1.7	1.1
YOLO	2.1	0.7	1.4	0.0	0.7	0.0	0.0	0.0	1.3
YUBA	0.0	5.0	1.7	3.3	4.9	0.0	0.0	0.0	0.0

Table E-6a Reported Incidence of Shigellosis Type C in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	6	3	1		2	2	3	3	2
BERKELEY				1	1				
COLUSA							1		
CONTRA COSTA	3			1	1	4	1	1	
DEL NORTE			1						
FRESNO	3	3		2	1			1	1
IMPERIAL	3			4		1	1	1	
KINGS						1			
LASSEN							1		
LONG BEACH	3	5		1	2		3	2	2
LOS ANGELES	91	56	61	43	38	25	26	28	31
MADERA		2							
MARIN		2				1		2	1
MENDOCINO							5		
MERCED				1			1		
MONO						1			
MONTEREY	2	1	4			1		3	1
NAPA		1	1		1				
ORANGE	12	15	11	10	10	8	15	11	5
PASADENA	2						2	1	
PLACER	1		2				1		
PLUMAS									3
RIVERSIDE	1	4	3	1	2	6	3	6	
SACRAMENTO	1	2	3			1	2	2	1
SAN BENITO				4		1	4	2	
SAN BERNARDINO	7	3	3	5	3	3	2	8	3
SAN DIEGO	28	25	14	14	10	14	12	17	12
SAN FRANCISCO	8	6	2	3	5	4	5	1	5
SAN JOAQUIN	3	5	1	2		2	3		1
SAN LUIS OBISPO				1		1			
SAN MATEO	8	5	5	3	4	2	1	4	
SANTA BARBARA	3	3	1			1			2
SANTA CLARA	24	10	14	1	3	4	8	7	22
SANTA CRUZ			1	1					2
SOLANO	7		2	1		2		1	
SONOMA				1	1	1			
STANISLAUS	2	2	2		1	2			1
SUTTER						1			1
TEHAMA				1					
TULARE	6	3	1	1	2	1		1	
VENTURA	7			1		1	2	1	3
YOLO	1		1					2	
YUBA			1						
Grand Total	232	156	135	103	87	91	102	105	99

Table E-6b Reported Incidence of Shigellosis Type C in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	0.5	0.3	0.1	0.0	0.2	0.2	0.2	0.2	0.2
BERKELEY	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
COLUSA	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0
CONTRA COSTA	0.4	0.0	0.0	0.1	0.1	0.5	0.1	0.1	0.0
DEL NORTE	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0
FRESNO	0.4	0.4	0.0	0.3	0.1	0.0	0.0	0.1	0.1
IMPERIAL	2.7	0.0	0.0	3.2	0.0	0.7	0.7	0.7	0.0
KINGS	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0
LASSEN	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0
LONG BEACH	0.7	1.1	0.0	0.2	0.5	0.0	0.7	0.5	0.4
LOS ANGELES	1.1	0.7	0.7	0.5	0.4	0.3	0.3	0.3	0.3
MADERA	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MARIN	0.0	0.9	0.0	0.0	0.0	0.4	0.0	0.8	0.4
MENDOCINO	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0
MERCED	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0
MONO	0.0	0.0	0.0	0.0	0.0	9.4	0.0	0.0	0.0
MONTEREY	0.6	0.3	1.1	0.0	0.0	0.3	0.0	0.8	0.3
NAPA	0.0	0.9	0.9	0.0	0.9	0.0	0.0	0.0	0.0
ORANGE	0.5	0.6	0.4	0.4	0.4	0.3	0.6	0.4	0.2
PASADENA	1.5	0.0	0.0	0.0	0.0	0.0	1.5	0.7	0.0
PLACER	0.6	0.0	1.1	0.0	0.0	0.0	0.5	0.0	0.0
PLUMAS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
RIVERSIDE	0.1	0.3	0.2	0.1	0.2	0.4	0.2	0.4	0.0
SACRAMENTO	0.1	0.2	0.3	0.0	0.0	0.1	0.2	0.2	0.1
SAN BENITO	0.0	0.0	0.0	10.2	0.0	2.4	9.2	4.4	0.0
SAN BERNARDINO	0.5	0.2	0.2	0.3	0.2	0.2	0.1	0.5	0.2
SAN DIEGO	1.1	1.0	0.5	0.5	0.4	0.5	0.4	0.6	0.4
SAN FRANCISCO	1.1	0.8	0.3	0.4	0.7	0.5	0.7	0.1	0.6
SAN JOAQUIN	0.6	1.0	0.2	0.4	0.0	0.4	0.6	0.0	0.2
SAN LUIS OBISPO	0.0	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.0
SAN MATEO	1.2	0.8	0.8	0.4	0.6	0.3	0.1	0.6	0.0
SANTA BARBARA	0.8	0.8	0.3	0.0	0.0	0.3	0.0	0.0	0.5
SANTA CLARA	1.6	0.7	0.9	0.1	0.2	0.3	0.5	0.4	1.3
SANTA CRUZ	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.8
SOLANO	2.1	0.0	0.6	0.3	0.0	0.5	0.0	0.3	0.0
SONOMA	0.0	0.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0
STANISLAUS	0.5	0.5	0.5	0.0	0.2	0.5	0.0	0.0	0.2
SUTTER	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	1.3
TEHAMA	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0
TULARE	1.9	0.9	0.3	0.3	0.6	0.3	0.0	0.3	0.0
VENTURA	1.0	0.0	0.0	0.1	0.0	0.1	0.3	0.1	0.4
YOLO	0.7	0.0	0.7	0.0	0.0	0.0	0.0	1.3	0.0
YUBA	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0

Table E-7a Reported Incidence of Shigellosis Type D in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	95	69	69	97	88	93	89	77	80
AMADOR						1			
BERKELEY	12	12	6	9	5	4	6	5	2
BUTTE	3	13	10	33	7	7		1	
CALAVERAS				2	1				1
COLUSA				1		3		1	3
CONTRA COSTA	34	1	23	58	40	62	16	32	29
DEL NORTE			1						
EL DORADO	1		3	4	4	2		2	1
FRESNO	56	37	79	39	37	112	106	36	30
GLENN	5		4	3		1			
HUMBOLDT		2		4	4		1	12	2
IMPERIAL	12	4	10	28	6	28	11	5	1
INYO			2			3			1
KERN	25	18	20	12	8	20	16	4	5
KINGS	3	3		6		3	7	7	
LAKE	1	1		2	1				1
LASSEN									2
LONG BEACH	52	33	55	102	30	64	46	61	42
LOS ANGELES	900	501	934	824	557	910	671	425	418
MADERA	5	2	15	14	5	11	10		15
MARIN	16	9	9	12	6	16	4	9	9
MARIPOSA			2	1					
MENDOCINO	2	2		3		4	2		55
MERCED	10	7	16	37	13	48	15	1	6
MODOC			3					1	
MONO			1			1			1
MONTEREY	6	10	16	19	4	30	12	8	18
NAPA	4	4	4	6	2	7	5	5	5
NEVADA	4		1			1	2	3	
ORANGE	174	103	169	127	55	266	167	125	133
PASADENA	29	7	18	13	41	40	16	20	10
PLACER	6	3	9	10	2	2	1	3	2
RIVERSIDE	91	37	86	99	45	95	60	51	33
SACRAMENTO	50	27	72	187	85	42	36	43	66
SAN BENITO	3		2	4	1	10	5	6	9
SAN BERNARDINO	99	74	61	130	108	175	75	62	35
SAN DIEGO	324	136	205	210	198	300	188	170	156
SAN FRANCISCO	129	89	183	110	103	223	160	96	50
SAN JOAQUIN	67	43	97	122	74	96	76	46	67
SAN LUIS OBISPO	16	8	15	5	1	3	1	3	5
SAN MATEO	56	59	66	105	60	113	58	51	61
SANTA BARBARA	30	13	29	13	5	20	11	10	28
SANTA CLARA	117	75	89	87	38	131	57	50	69
SANTA CRUZ	21	10	13	12	3	20	15	7	7
SHASTA	1	1	17	8	9	4	1		4
SISKIYOU			1	5					
SOLANO	20	22	9	27	13	34	6	13	14
SONOMA	10	3	7	7	8	10	6	9	12
STANISLAUS	34	22	57	52	11	49	31	20	26
SUTTER	5	4	6	6	4	2		2	2
TEHAMA				3	1	1			1
TRINITY					1			1	
TULARE	43	22	59	73	27	41	18	10	9
TUOLUMNE				1		2			
VENTURA	55	21	48	28	20	26	9	9	39
YOLO	4	3	6	4	2	3	4	4	1
YUBA	2	12	1	4	4	5		2	
Grand Total	2632	1522	2608	2768	1737	3144	2020	1508	1566

Table E-7b Reported Incidence of Shigellosis Type D in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	8.1	5.8	5.7	7.9	7.1	7.5	7.1	6.0	6.1
AMADOR	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0
BERKELEY	11.7	11.6	5.8	8.6	4.8	3.8	5.7	4.7	1.9
BUTTE	1.6	7.0	5.3	17.3	3.6	3.6	0.0	0.5	0.0
CALAVERAS	0.0	0.0	0.0	5.7	2.8	0.0	0.0	0.0	2.6
COLUSA	0.0	0.0	0.0	5.8	0.0	16.9	0.0	5.4	16.1
CONTRA COSTA	4.2	0.1	2.8	6.9	4.7	7.2	1.8	3.6	3.2
DEL NORTE	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0
EL DORADO	0.8	0.0	2.2	2.9	2.8	1.4	0.0	1.4	0.7
FRESNO	8.4	5.4	11.2	5.4	5.0	15.0	13.9	4.6	3.8
GLENN	20.2	0.0	15.6	11.6	0.0	3.8	0.0	0.0	0.0
HUMBOLDT	0.0	1.7	0.0	3.2	3.2	0.0	0.8	9.6	1.6
IMPERIAL	11.0	3.5	8.4	22.2	4.5	20.7	7.9	3.5	0.7
INYO	0.0	0.0	10.9	0.0	0.0	16.3	0.0	0.0	5.5
KERN	4.6	3.2	3.5	2.0	1.3	3.3	2.6	0.6	0.8
KINGS	3.0	2.9	0.0	5.5	0.0	2.6	6.1	6.0	0.0
LAKE	2.0	1.9	0.0	3.7	1.8	0.0	0.0	0.0	1.8
LASSEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
LONG BEACH	12.1	7.5	12.4	23.2	6.8	14.6	10.5	13.8	9.4
LOS ANGELES	10.8	6.0	11.0	9.5	6.4	10.4	7.6	4.8	4.6
MADERA	5.7	2.2	15.6	14.0	4.8	10.4	9.2	0.0	13.1
MARIN	7.0	3.9	3.8	5.1	2.5	6.7	1.7	3.7	3.7
MARIPOSA	0.0	0.0	13.2	6.4	0.0	0.0	0.0	0.0	0.0
MENDOCINO	2.5	2.5	0.0	3.6	0.0	4.8	2.4	0.0	63.9
MERCED	5.6	3.8	8.5	19.3	6.6	24.3	7.6	0.5	3.0
MODOC	0.0	0.0	30.4	0.0	0.0	0.0	0.0	9.9	0.0
MONO	0.0	0.0	10.0	0.0	0.0	9.4	0.0	0.0	9.5
MONTEREY	1.7	2.8	4.4	5.1	1.1	8.3	3.3	2.2	4.7
NAPA	3.6	3.6	3.5	5.2	1.7	6.0	4.2	4.2	4.1
NEVADA	5.1	0.0	1.2	0.0	0.0	1.2	2.3	3.4	0.0
ORANGE	7.2	4.2	6.8	5.0	2.1	10.2	6.3	4.7	4.9
PASADENA	22.0	5.3	13.5	9.6	30.3	29.3	11.7	14.4	7.1
PLACER	3.5	1.7	4.9	5.3	1.0	1.0	0.5	1.4	0.9
RIVERSIDE	7.8	3.0	6.8	7.6	3.4	7.0	4.3	3.6	2.3
SACRAMENTO	4.8	2.5	6.6	17.0	7.7	3.8	3.2	3.8	5.7
SAN BENITO	8.2	0.0	5.2	10.2	2.5	24.0	11.5	13.3	19.2
SAN BERNARDINO	7.0	5.1	4.0	8.4	6.9	11.1	4.7	3.9	2.1
SAN DIEGO	13.0	5.4	7.9	8.0	7.5	11.3	7.0	6.2	5.6
SAN FRANCISCO	17.8	12.2	24.9	14.8	13.7	29.7	21.1	12.4	6.4
SAN JOAQUIN	13.9	8.8	19.4	24.1	14.4	18.5	14.4	8.6	12.3
SAN LUIS OBISPO	7.4	3.7	6.8	2.2	0.4	1.3	0.4	1.3	2.1
SAN MATEO	8.6	9.0	9.9	15.6	8.8	16.5	8.4	7.2	8.5
SANTA BARBARA	8.1	3.5	7.6	3.4	1.3	5.1	2.8	2.5	6.9
SANTA CLARA	7.8	4.9	5.8	5.6	2.4	8.2	3.5	3.0	4.1
SANTA CRUZ	9.1	4.3	5.6	5.1	1.3	8.3	6.2	2.9	2.8
SHASTA	0.7	0.7	11.0	5.1	5.7	2.5	0.6	0.0	2.4
SISKIYOU	0.0	0.0	2.3	11.3	0.0	0.0	0.0	0.0	0.0
SOLANO	5.9	6.3	2.5	7.4	3.5	9.2	1.6	3.5	3.7
SONOMA	2.6	0.8	1.7	1.7	1.9	2.4	1.4	2.1	2.7
STANISLAUS	9.2	5.8	14.5	13.0	2.7	11.9	7.5	4.7	6.1
SUTTER	7.8	6.0	8.8	8.6	5.6	2.7	0.0	2.7	2.6
TEHAMA	0.0	0.0	0.0	5.7	1.9	1.9	0.0	0.0	1.8
TRINITY	0.0	0.0	0.0	0.0	7.5	0.0	0.0	7.5	0.0
TULARE	13.8	6.9	18.0	21.8	7.9	11.8	5.1	2.8	2.5
TUOLUMNE	0.0	0.0	0.0	2.0	0.0	3.9	0.0	0.0	0.0
VENTURA	8.2	3.1	7.0	4.0	2.8	3.7	1.3	1.2	5.3
YOLO	2.8	2.1	4.1	2.7	1.4	2.0	2.6	2.6	0.6
YUBA	3.4	20.2	1.7	6.5	6.5	8.1	0.0	3.3	0.0

Table E-8a Reported Incidence of Shigellosis Type Unknown in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	57	15	17	57	57	29	28		5
AMADOR	1		1			1			1
BERKELEY	2	6	6	5	1		4	3	1
BUTTE	9	17	20	14	7	4	4	6	2
CALAVERAS	1			1		1			
COLUSA	1		1					1	
CONTRA COSTA	37	72	5	14	23	18	5	12	18
DEL NORTE	2	9		3					
EL DORADO	1		2	2	3	2	5		1
FRESNO	13	19	17	8	16	23	3	4	24
GLENN		1		1					
HUMBOLDT	3	1	1	2		2	2	18	16
IMPERIAL	16	8	17	17	3	11	24	46	17
INYO		2		1		3			1
KERN	32	56	60	57	68	72	73	74	66
KINGS	1						3	2	2
LAKE	1	1						1	1
LASSEN			1					3	
LONG BEACH	9	5	1	8	3	4	4		3
LOS ANGELES	218	176	230	178	194	255	168	95	115
MADERA	5		1		1		9	9	9
MARIN	2	5	1	2	1	1	5	2	1
MENDOCINO			2	1		4	5	1	3
MERCED	25	16	18	14	23	19	8	5	6
MODOC		1					2		
MONTEREY	32	7	23	19	10	36	22	14	18
NAPA				1	2	3	1		2
NEVADA	1	2		1	1				
ORANGE	8	9	15	3	8	1		2	1
PASADENA	1	1	3			1	1	2	
PLACER						1	2		2
RIVERSIDE	38	49	51	21	34	65	20	33	35
SACRAMENTO	11	13	10	22	9	10	9	13	5
SAN BENITO	5	2			3	1	1		
SAN BERNARDINO	22	6	17	38	18	29	18	18	12
SAN DIEGO	52	45	48	55	46	46	55	60	48
SAN FRANCISCO	2	2	3	1		2	1	1	
SAN JOAQUIN	4	19	23	13	2	5			1
SAN LUIS OBISPO	1	2	4		1	1			
SAN MATEO	32	27	11	7	8	10	15	8	7
SANTA BARBARA		3	5	4	7	11	8	4	8
SANTA CLARA	57	53	48	49	45	55	41	55	61
SANTA CRUZ	5	3	10	9	7	16	9	21	7
SHASTA				4			1	1	2
SISKIYOU	4				6	1			
SOLANO	6	2	1	3	4	8	5	4	12
SONOMA	18	12	10	22	14	28	19	22	17
STANISLAUS	1								
SUTTER	1	2				1	1		
TEHAMA	1	2	2	2	2	1	1	1	
TULARE	7	7	9	11	9	7	23	19	26
TUOLUMNE	1		1	1	1	2			
VENTURA	18	14	15	23	22	18	11	11	10
YOLO		2	3	5	4	8	4	9	5
YUBA	9	17	4	2	3	1	1	1	1
Grand Total	773	711	717	701	666	817	621	581	572

Table E-8b Reported Incidence of Shigellosis Type Unknown in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	4.9	1.3	1.4	4.7	4.6	2.3	2.2	0.0	0.4
AMADOR	3.3	0.0	3.2	0.0	0.0	3.1	0.0	0.0	3.0
BERKELEY	1.9	5.8	5.8	4.8	1.0	0.0	3.8	2.8	0.9
BUTTE	4.9	9.2	10.6	7.4	3.6	2.1	2.0	3.0	1.0
CALAVERAS	3.1	0.0	0.0	2.8	0.0	2.7	0.0	0.0	0.0
COLUSA	6.1	0.0	5.9	0.0	0.0	0.0	0.0	5.4	0.0
CONTRA COSTA	4.6	8.8	0.6	1.7	2.7	2.1	0.6	1.4	2.0
DEL NORTE	8.5	35.7	0.0	11.1	0.0	0.0	0.0	0.0	0.0
EL DORADO	0.8	0.0	1.5	1.5	2.1	1.4	3.5	0.0	0.7
FRESNO	1.9	2.8	2.4	1.1	2.2	3.1	0.4	0.5	3.1
GLENN	0.0	4.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0
HUMBOLDT	2.5	0.8	0.8	1.6	0.0	1.6	1.6	14.3	12.7
IMPERIAL	14.6	7.0	14.3	13.4	2.3	8.1	17.2	32.6	11.9
INYO	0.0	10.9	0.0	5.4	0.0	16.3	0.0	0.0	5.5
KERN	5.9	10.0	10.4	9.6	11.3	11.7	11.8	11.8	10.4
KINGS	1.0	0.0	0.0	0.0	0.0	0.0	2.6	1.7	1.7
LAKE	2.0	1.9	0.0	0.0	0.0	0.0	0.0	1.8	1.8
LASSEN	0.0	0.0	3.6	0.0	0.0	0.0	0.0	8.7	0.0
LONG BEACH	2.1	1.1	0.2	1.8	0.7	0.9	0.9	0.0	0.7
LOS ANGELES	2.6	2.1	2.7	2.1	2.2	2.9	1.9	1.1	1.3
MADERA	5.7	0.0	1.0	0.0	1.0	0.0	8.3	8.0	7.9
MARIN	0.9	2.2	0.4	0.8	0.4	0.4	2.1	0.8	0.4
MENDOCINO	0.0	0.0	2.4	1.2	0.0	4.8	5.9	1.2	3.5
MERCED	14.0	8.7	9.6	7.3	11.7	9.6	4.0	2.5	3.0
MODOC	0.0	10.2	0.0	0.0	0.0	0.0	19.9	0.0	0.0
MONTEREY	9.0	1.9	6.3	5.1	2.7	10.0	6.1	3.8	4.7
NAPA	0.0	0.0	0.0	0.9	1.7	2.6	0.8	0.0	1.6
NEVADA	1.3	2.5	0.0	1.2	1.2	0.0	0.0	0.0	0.0
ORANGE	0.3	0.4	0.6	0.1	0.3	0.0	0.0	0.1	0.0
PASADENA	0.8	0.8	2.2	0.0	0.0	0.7	0.7	1.4	0.0
PLACER	0.0	0.0	0.0	0.0	0.0	0.5	1.0	0.0	0.9
RIVERSIDE	3.2	4.0	4.0	1.6	2.6	4.8	1.4	2.4	2.4
SACRAMENTO	1.1	1.2	0.9	2.0	0.8	0.9	0.8	1.1	0.4
SAN BENITO	13.6	5.4	0.0	0.0	7.4	2.4	2.3	0.0	0.0
SAN BERNARDINO	1.6	0.4	1.1	2.5	1.2	1.8	1.1	1.1	0.7
SAN DIEGO	2.1	1.8	1.9	2.1	1.7	1.7	2.1	2.2	1.7
SAN FRANCISCO	0.3	0.3	0.4	0.1	0.0	0.3	0.1	0.1	0.0
SAN JOAQUIN	0.8	3.9	4.6	2.6	0.4	1.0	0.0	0.0	0.2
SAN LUIS OBISPO	0.5	0.9	1.8	0.0	0.4	0.4	0.0	0.0	0.0
SAN MATEO	4.9	4.1	1.7	1.0	1.2	1.5	2.2	1.1	1.0
SANTA BARBARA	0.0	0.8	1.3	1.0	1.8	2.8	2.0	1.0	2.0
SANTA CLARA	3.8	3.5	3.1	3.1	2.8	3.4	2.5	3.3	3.6
SANTA CRUZ	2.2	1.3	4.3	3.8	2.9	6.7	3.7	8.6	2.8
SHASTA	0.0	0.0	0.0	2.5	0.0	0.0	0.6	0.6	1.2
SISKIYOU	9.2	0.0	0.0	0.0	13.5	2.2	0.0	0.0	0.0
SOLANO	1.8	0.6	0.3	0.8	1.1	2.2	1.3	1.1	3.1
SONOMA	4.6	3.0	2.5	5.4	3.4	6.7	4.5	5.1	3.9
STANISLAUS	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUTTER	1.6	3.0	0.0	0.0	0.0	1.4	1.3	0.0	0.0
TEHAMA	2.0	4.0	3.9	3.8	3.8	1.9	1.8	1.8	0.0
TULARE	2.2	2.2	2.7	3.3	2.6	2.0	6.5	5.3	7.2
TUOLUMNE	2.1	0.0	2.0	2.0	1.9	3.9	0.0	0.0	0.0
VENTURA	2.7	2.1	2.2	3.3	3.1	2.5	1.5	1.5	1.4
YOLO	0.0	1.4	2.1	3.4	2.7	5.4	2.6	5.9	3.2
YUBA	15.5	28.6	6.6	3.3	4.9	1.6	1.6	1.6	1.6

Table E-9a Reported Incidence of Amoebiasis in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	74	34	32	45	23	20	31	67	29
ALPINE						2			
AMADOR			1			1		2	
BERKELEY	13	9	5	9	2	3	5	9	3
BUTTE		1		1	1	3	1	2	7
CALAVERAS		1	1		1				
COLUSA	1			1					
CONTRA COSTA	12	13	6	14	16	10	9	11	7
DEL NORTE				1					
EL DORADO	2					1			
FRESNO	4	4	3	8	3	2	2	2	3
GLENN	2								
HUMBOLDT	1	1			1	1	2	2	
IMPERIAL		1	3	1	1	3	1		
INYO	1		1			1			
KERN	6	8	12	10	8	1	2	4	4
KINGS	1		3	4		1		1	
LAKE		1			1	1			
LASSEN								1	1
LONG BEACH	10	24	20	21	14	13	16	13	14
LOS ANGELES	446	361	250	306	220	186	204	173	167
MADERA	1	1		2		1			
MARIN	33	38	26	31	36	41	30	26	22
MARIPOSA				1		1	1		
MENDOCINO	2	1				2	1		
MERCED	3	10	20	8	11	10	2	3	3
MODOC				1					
MONO									1
MONTEREY	18	8	2	6	5		1	2	4
NAPA	5	3	4	1	5	4	1	3	6
NEVADA					1	1			1
ORANGE	110	81	123	93	50	48	36	41	26
PASADENA	5	8	4	3	1			2	
PLACER		4	2	1	2	2	1	2	
PLUMAS			1						
RIVERSIDE	15	18	14	9	7	6	15	7	12
SACRAMENTO	21	22	3	3	2	6	6	3	4
SAN BENITO		1	1	2				1	
SAN BERNARDINO	14	19	16	21	21	11	11	12	6
SAN DIEGO	26	21	37	37	49	62	62	82	27
SAN FRANCISCO	315	293	195	259	255	282	172	296	187
SAN JOAQUIN	22	41	34	18	7	5	4	6	13
SAN LUIS OBISPO	8	2	2	6	1	4	4	1	4
SAN MATEO	37	40	25	16	26	10	16	27	19
SANTA BARBARA	84	36	58	42	59	28	96	60	55
SANTA CLARA	238	132	111	94	90	96	52	44	47
SANTA CRUZ	13	10	11	3	12	5	1	4	6
SHASTA	3					1			
SISKIYOU		1							1
SOLANO	10	7	8	4	3	1	2		2
SONOMA	32	27	16	15	12	12	16	4	5
STANISLAUS	28	24	38	35	15	15	7	5	1
SUTTER	8	2	3	3	1	1		1	
TEHAMA					1		1		
TRINITY	3		1						
TULARE	7	29	35	33	23	21	6	10	3
TUOLUMNE	1	2	1						
VENTURA	10	3	6	7	4	6	1	2	4
YOLO	1	1	2	4		1	4	1	3
YUBA				3		2		1	1
Grand Total	1646	1343	1136	1182	990	934	822	933	698

Table E-9b Reported Incidence of Amoebiasis in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	6.3	2.9	2.7	3.7	1.9	1.6	2.5	5.3	2.2
ALPINE	0.0	0.0	0.0	0.0	0.0	175.4	0.0	0.0	0.0
AMADOR	0.0	0.0	3.2	0.0	0.0	3.1	0.0	6.0	0.0
BERKELEY	12.7	8.7	4.8	8.6	1.9	2.9	4.8	8.5	2.8
BUTTE	0.0	0.5	0.0	0.5	0.5	1.5	0.5	1.0	3.5
CALAVERAS	0.0	3.0	2.9	0.0	2.8	0.0	0.0	0.0	0.0
COLUSA	6.1	0.0	0.0	5.8	0.0	0.0	0.0	0.0	0.0
CONTRA COSTA	1.5	1.6	0.7	1.7	1.9	1.2	1.0	1.2	0.8
DEL NORTE	0.0	0.0	0.0	3.7	0.0	0.0	0.0	0.0	0.0
EL DORADO	1.6	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0
FRESNO	0.6	0.6	0.4	1.1	0.4	0.3	0.3	0.3	0.4
GLENN	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HUMBOLDT	0.8	0.8	0.0	0.0	0.8	0.8	1.6	1.6	0.0
IMPERIAL	0.0	0.9	2.5	0.8	0.8	2.2	0.7	0.0	0.0
INYO	5.5	0.0	5.5	0.0	0.0	5.4	0.0	0.0	0.0
KERN	1.1	1.4	2.1	1.7	1.3	0.2	0.3	0.6	0.6
KINGS	1.0	0.0	2.8	3.6	0.0	0.9	0.0	0.9	0.0
LAKE	0.0	1.9	0.0	0.0	1.8	1.8	0.0	0.0	0.0
LASSEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	3.0
LONG BEACH	2.3	5.5	4.5	4.8	3.2	3.0	3.7	2.9	3.1
LOS ANGELES	5.4	4.3	2.9	3.5	2.5	2.1	2.3	1.9	1.9
MADERA	1.1	1.1	0.0	2.0	0.0	0.9	0.0	0.0	0.0
MARIN	14.3	16.4	11.1	13.1	15.2	17.2	12.5	10.8	9.0
MARIPOSA	0.0	0.0	0.0	6.4	0.0	6.3	6.3	0.0	0.0
MENDOCINO	2.5	1.2	0.0	0.0	0.0	2.4	1.2	0.0	0.0
MERCED	1.7	5.4	10.6	4.2	5.6	5.1	1.0	1.5	1.5
MODOC	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
MONO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
MONTEREY	5.1	2.2	0.5	1.6	1.4	0.0	0.3	0.5	1.0
NAPA	4.5	2.7	3.5	0.9	4.3	3.4	0.8	2.5	4.9
NEVADA	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0	1.1
ORANGE	4.6	3.3	4.9	3.7	1.9	1.8	1.4	1.5	1.0
PASADENA	3.8	6.0	3.0	2.2	0.7	0.0	0.0	1.4	0.0
PLACER	0.0	2.2	1.1	0.5	1.0	1.0	0.5	0.9	0.0
PLUMAS	0.0	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0
RIVERSIDE	1.3	1.5	1.1	0.7	0.5	0.4	1.1	0.5	0.8
SACRAMENTO	2.0	2.1	0.3	0.3	0.2	0.5	0.5	0.3	0.3
SAN BENITO	0.0	2.7	2.6	5.1	0.0	0.0	0.0	2.2	0.0
SAN BERNARDINO	1.0	1.3	1.1	1.4	1.3	0.7	0.7	0.7	0.4
SAN DIEGO	1.0	0.8	1.4	1.4	1.9	2.3	2.3	3.0	1.0
SAN FRANCISCO	43.5	40.1	26.5	34.8	33.9	37.5	22.6	38.3	23.9
SAN JOAQUIN	4.6	8.4	6.8	3.5	1.4	1.0	0.8	1.1	2.4
SAN LUIS OBISPO	3.7	0.9	0.9	2.7	0.4	1.8	1.7	0.4	1.7
SAN MATEO	5.7	6.1	3.8	2.4	3.8	1.5	2.3	3.8	2.7
SANTA BARBARA	22.7	9.6	15.3	11.0	15.3	7.2	24.5	15.1	13.7
SANTA CLARA	15.9	8.7	7.2	6.0	5.7	6.0	3.2	2.7	2.8
SANTA CRUZ	5.7	4.3	4.7	1.3	5.0	2.1	0.4	1.6	2.4
SHASTA	2.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
SISKIYOU	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	2.3
SOLANO	2.9	2.0	2.2	1.1	0.8	0.3	0.5	0.0	0.5
SONOMA	8.2	6.8	4.0	3.7	2.9	2.9	3.8	0.9	1.1
STANISLAUS	7.6	6.3	9.7	8.7	3.7	3.6	1.7	1.2	0.2
SUTTER	12.4	3.0	4.4	4.3	1.4	1.4	0.0	1.3	0.0
TEHAMA	0.0	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0
TRINITY	23.0	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0
TULARE	2.2	9.1	10.7	9.9	6.7	6.1	1.7	2.8	0.8
TUOLUMNE	2.1	4.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
VENTURA	1.5	0.4	0.9	1.0	0.6	0.8	0.1	0.3	0.5
YOLO	0.7	0.7	1.4	2.7	0.0	0.7	2.6	0.7	1.9
YUBA	0.0	0.0	0.0	4.9	0.0	3.2	0.0	1.6	1.6

Table E-10a Reported Incidence of Cryptosporidiosis in California (1990-1998)

Local Health Department	Reported Cases by Year 1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA		1	2	1		3	8	8	29
AMADOR									1
BERKELEY	1	1	1	2	1		1	4	4
BUTTE					1				3
CONTRA COSTA	1	3	6	5	3	1	3	11	15
DEL NORTE			1						
EL DORADO	1								2
FRESNO		2	1	2	1	2	36	2	6
GLENN								1	
HUMBOLDT		1	2			2		2	1
IMPERIAL							2	1	
INYO									1
KERN		1		1	7	5	9	4	
LASSEN							2		2
LONG BEACH		5	10	18	17	24	10	4	3
LOS ANGELES	3	10	108	96	202	214	177	81	103
MADERA				1			2		
MARIN	2	4	4		2	2	3	10	9
MARIPOSA				1					
MENDOCINO					2	1			
MODOC								1	
MONTEREY	2					1	3	5	2
NAPA	1	1				1	1	2	2
NEVADA						1	1		5
ORANGE	15	15	18	20	8	28	9	13	21
PASADENA					4	1	2	1	1
PLACER									1
RIVERSIDE	1	2	8	4	9	12	9	1	9
SACRAMENTO	1		1		1	3	7	7	7
SAN BERNARDINO	11	1	5	15	14	12	11	4	4
SAN DIEGO	2	6	12	46	64	60	45	24	41
SAN FRANCISCO	116	144	85	138	118	125	84	66	27
SAN JOAQUIN		1	1	2	7	1		1	4
SAN LUIS OBISPO		1	1	1	1		2		
SAN MATEO	4	7	3	2	1	2	5	7	7
SANTA BARBARA						1	1	1	5
SANTA CLARA	2	2	7	3	7	5	16	20	14
SANTA CRUZ	2			2	2		1	4	4
SHASTA				1					2
SIERRA						1			1
SISKIYOU								1	
SOLANO	1	1	3	4	1	6	2	14	13
SONOMA		1			1	3	4	17	10
STANISLAUS					1		2	2	1
SUTTER							4	1	
TULARE					1				1
VENTURA			3	2	3	2	6	4	7
YOLO					1	2	1	3	4
YUBA							1	1	
Grand Total	166	210	282	367	480	521	470	328	372

Table E-10b Reported Incidence of Cryptosporidiosis in California (1990-1998)

Local Health Department	Disease Incidence/100,000 by Year 1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	0.0	0.1	0.2	0.1	0.0	0.2	0.6	0.6	2.2
AMADOR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
BERKELEY	1.0	1.0	1.0	1.9	1.0	0.0	1.0	3.8	3.7
BUTTE	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.5
CONTRA COSTA	0.1	0.4	0.7	0.6	0.4	0.1	0.3	1.2	1.7
DEL NORTE	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0
EL DORADO	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
FRESNO	0.0	0.3	0.1	0.3	0.1	0.3	4.7	0.3	0.8
GLENN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0
HUMBOLDT	0.0	0.8	1.6	0.0	0.0	1.6	0.0	1.6	0.8
IMPERIAL	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.7	0.0
INYO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5
KERN	0.0	0.2	0.0	0.2	1.2	0.8	1.5	0.6	0.0
LASSEN	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.0	5.9
LONG BEACH	0.0	1.1	2.3	4.1	3.9	5.5	2.3	0.9	0.7
LOS ANGELES	0.0	0.1	1.3	1.1	2.3	2.4	2.0	0.9	1.1
MADERA	0.0	0.0	0.0	1.0	0.0	0.0	1.8	0.0	0.0
MARIN	0.9	1.7	1.7	0.0	0.8	0.8	1.3	4.1	3.7
MARIPOSA	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0	0.0
MENDOCINO	0.0	0.0	0.0	0.0	2.4	1.2	0.0	0.0	0.0
MODOC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	0.0
MONTEREY	0.6	0.0	0.0	0.0	0.0	0.3	0.8	1.4	0.5
NAPA	0.9	0.9	0.0	0.0	0.0	0.9	0.8	1.7	1.6
NEVADA	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.0	5.6
ORANGE	0.6	0.6	0.7	0.8	0.3	1.1	0.3	0.5	0.8
PASADENA	0.0	0.0	0.0	0.0	3.0	0.7	1.5	0.7	0.7
PLACER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
RIVERSIDE	0.1	0.2	0.6	0.3	0.7	0.9	0.7	0.1	0.6
SACRAMENTO	0.1	0.0	0.1	0.0	0.1	0.3	0.6	0.6	0.6
SAN BERNARDINO	0.8	0.1	0.3	1.0	0.9	0.8	0.7	0.2	0.2
SAN DIEGO	0.1	0.2	0.5	1.8	2.4	2.3	1.7	0.9	1.5
SAN FRANCISCO	16.0	19.7	11.6	18.5	15.7	16.6	11.1	8.5	3.4
SAN JOAQUIN	0.0	0.2	0.2	0.4	1.4	0.2	0.0	0.2	0.7
SAN LUIS OBISPO	0.0	0.5	0.5	0.4	0.4	0.0	0.9	0.0	0.0
SAN MATEO	0.6	1.1	0.5	0.3	0.1	0.3	0.7	1.0	1.0
SANTA BARBARA	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	1.2
SANTA CLARA	0.1	0.1	0.5	0.2	0.4	0.3	1.0	1.2	0.8
SANTA CRUZ	0.9	0.0	0.0	0.8	0.8	0.0	0.4	1.6	1.6
SHASTA	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	1.2
SIERRA	0.0	0.0	0.0	0.0	0.0	29.7	0.0	0.0	29.9
SISKIYOU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0
SOLANO	0.3	0.3	0.8	1.1	0.3	1.6	0.5	3.7	3.4
SONOMA	0.0	0.3	0.0	0.0	0.2	0.7	0.9	4.0	2.3
STANISLAUS	0.0	0.0	0.0	0.0	0.2	0.0	0.5	0.5	0.2
SUTTER	0.0	0.0	0.0	0.0	0.0	0.0	5.4	1.3	0.0
TULARE	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
VENTURA	0.0	0.0	0.4	0.3	0.4	0.3	0.8	0.6	1.0
YOLO	0.0	0.0	0.0	0.0	0.7	1.3	0.7	2.0	2.6
YUBA	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.6	0.0

Table E-11a Reported Incidence of Cryptosporidosis Type S in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	2	2	1	2	1	2	3	2	1
BERKELEY					1				
BUTTE				1					
CALAVERAS							1		
CONTRA COSTA		1	2	1	1	1	3	1	1
FRESNO		1			1			5	2
IMPERIAL	1						1	1	
KERN		1	1			1			1
LONG BEACH	2	5	1	4	1	1	2		
LOS ANGELES	59	58	61	57	43	26	33	36	23
MARIN					2	1		1	
MENDOCINO		1						3	
MERCED				3		2			
MONTEREY	7	3	6	3	3	3			
NAPA				1	1	1			
ORANGE	27	38	24	25	19	14	13	21	15
PASADENA		1		2		1		1	
PLACER					1				
RIVERSIDE	2		10	5	7	4	2	3	3
SACRAMENTO				1		1			
SAN BENITO				1		1			
SAN BERNARDINO	2	5	4	3	7	2	2	1	3
SAN DIEGO	9	9	16	8	8	13	10	12	13
SAN FRANCISCO	1		2	3	4	2	3	4	
SAN JOAQUIN	2	2	3	2			2		
SAN LUIS OBISPO	1	1	1	1			1	3	
SAN MATEO	4	2		1		3		2	
SANTA BARBARA		2	4	1		4	1	1	1
SANTA CLARA	13	6	7	11	4	4	8	9	6
SANTA CRUZ	2		1	1	1	1	1		1
SHASTA								1	
SISKIYOU		1							
SONOMA	2	1	2	3	1		1	1	5
STANISLAUS	4		3	1	2		2	2	2
SUTTER					5	2		2	2
TEHAMA					1				
TULARE				2	1	1		1	1
TUOLUMNE								1	
VENTURA	4		1	1	3	2	2	5	1
YOLO		1					2		1
YUBA	1						1		
Grand Total	145	141	150	144	118	93	94	119	83

Table E-11b Reported Incidence of Cryptosporidosis Type S in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1
BERKELEY	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
BUTTE	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
CALAVERAS	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0
CONTRA COSTA	0.0	0.1	0.2	0.1	0.1	0.1	0.3	0.1	0.1
FRESNO	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.6	0.3
IMPERIAL	0.9	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0
KERN	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.2
LONG BEACH	0.5	1.1	0.2	0.9	0.2	0.2	0.5	0.0	0.0
LOS ANGELES	0.7	0.7	0.7	0.7	0.5	0.3	0.4	0.4	0.3
MARIN	0.0	0.0	0.0	0.0	0.8	0.4	0.0	0.4	0.0
MENDOCINO	0.0	1.2	0.0	0.0	0.0	0.0	0.0	3.5	0.0
MERCED	0.0	0.0	0.0	1.6	0.0	1.0	0.0	0.0	0.0
MONTEREY	2.0	0.8	1.6	0.8	0.8	0.8	0.0	0.0	0.0
NAPA	0.0	0.0	0.0	0.9	0.9	0.9	0.0	0.0	0.0
ORANGE	1.1	1.6	1.0	1.0	0.7	0.5	0.5	0.8	0.5
PASADENA	0.0	0.8	0.0	1.5	0.0	0.7	0.0	0.7	0.0
PLACER	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
RIVERSIDE	0.2	0.0	0.8	0.4	0.5	0.3	0.1	0.2	0.2
SACRAMENTO	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
SAN BENITO	0.0	0.0	0.0	2.5	0.0	2.4	0.0	0.0	0.0
SAN BERNARDINO	0.1	0.3	0.3	0.2	0.4	0.1	0.1	0.1	0.2
SAN DIEGO	0.4	0.4	0.6	0.3	0.3	0.5	0.4	0.4	0.5
SAN FRANCISCO	0.1	0.0	0.3	0.4	0.5	0.3	0.4	0.5	0.0
SAN JOAQUIN	0.4	0.4	0.6	0.4	0.0	0.0	0.4	0.0	0.0
SAN LUIS OBISPO	0.5	0.5	0.5	0.4	0.0	0.0	0.4	1.3	0.0
SAN MATEO	0.6	0.3	0.0	0.1	0.0	0.4	0.0	0.3	0.0
SANTA BARBARA	0.0	0.5	1.1	0.3	0.0	1.0	0.3	0.3	0.2
SANTA CLARA	0.9	0.4	0.5	0.7	0.3	0.3	0.5	0.5	0.4
SANTA CRUZ	0.9	0.0	0.4	0.4	0.4	0.4	0.4	0.0	0.4
SHASTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
SISKIYOU	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SONOMA	0.5	0.3	0.5	0.7	0.2	0.0	0.2	0.2	1.1
STANISLAUS	1.1	0.0	0.8	0.2	0.5	0.0	0.5	0.5	0.5
SUTTER	0.0	0.0	0.0	0.0	7.0	2.7	0.0	2.7	2.6
TEHAMA	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
TULARE	0.0	0.0	0.0	0.6	0.3	0.3	0.0	0.3	0.3
TUOLUMNE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
VENTURA	0.6	0.0	0.1	0.1	0.4	0.3	0.3	0.7	0.1
YOLO	0.0	0.7	0.0	0.0	0.0	0.0	1.3	0.0	0.6
YUBA	1.7	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0

Table E-12a Reported Incidence of Giardiasis S in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	301	217	305	239	149	153	152	270	
ALPINE			3			1			
AMADOR	4	7	11	4	14	9	8	4	8
BERKELEY	37	30	35	24	16	17	29	41	15
BUTTE	44	56	59	56	47	47	41	51	37
CALAVERAS	5	3	14	8	6	4	12	8	5
COLUSA	5	4	6	3	1	3	2	2	1
CONTRA COSTA	216	182	75	194	214	139	162	204	153
DEL NORTE	1	10	8	6	2	2	6	2	
EL DORADO	14	16	35	10	15	14	11	15	12
FRESNO	238	320	304	247	223	204	132	77	88
GLENN	4	6	14	5	3	5	5	4	1
HUMBOLDT	15	14	21	33	19	28	29	22	13
IMPERIAL	4	3	8	22	5	4	10	9	3
INYO	5	18	27	17	6	2		2	
KERN	83	102	153	117	73	65	93	78	82
KINGS	13	29	11	31	5	2	4	12	8
LAKE	18	21	21	26	12	15	29	2	2
LASSEN	2	3	5	2	5	2	5	13	5
LONG BEACH	107	89	125	89	89	64	85	73	63
LOS ANGELES	1808	1635	1667	1671	1177	924	979	804	724
MADERA	3	6	16	5	12	11	8	7	3
MARIN	108	155	213	141	138	137	75	104	98
MARIPOSA	2	3	3	3		1	2		2
MENDOCINO	22	21	12	19	15	44	31	34	23
MERCED	111	102	111	84	102	41	65	36	34
MODOC	2	2	6	7	2	3	1	2	2
MONO	2	6	1	7	2	1	1	2	3
MONTEREY	81	53	35	40	30	41	30	25	38
NAPA	39	34	108	72	48	64	32	32	41
NEVADA	43	28	48	17	25	12	33	26	15
ORANGE	666	472	668	674	302	406	359	321	272
PASADENA	47	58	51	39	27	16	28	27	20
PLACER	39	51	46	44	29	40	57	52	48
PLUMAS	3	36	54	20	8	6	4	8	8
RIVERSIDE	166	162	167	196	98	122	108	103	91
SACRAMENTO	241	329	267	198	95	62	63	78	106
SAN BENITO	6	8	11	10	2	2	6	15	7
SAN BERNARDINO	178	161	201	223	209	128	123	135	98
SAN DIEGO	317	311	497	736	695	573	507	455	455
SAN FRANCISCO	332	289	263	347	405	410	405	384	360
SAN JOAQUIN	295	266	297	196	249	195	178	114	99
SAN LUIS OBISPO	98	46	47	95	47	36	51	58	51
SAN MATEO	199	171	191	172	142	146	133	134	103
SANTA BARBARA	163	145	242	145	200	142	245	180	183
SANTA CLARA	651	545	556	616	554	511	452	369	307
SANTA CRUZ	50	37	110	29	39	45	34	35	34
SHASTA	19	21	24	27	31	14	4	9	8
SIERRA			4	4	1	2	1		2
SISKIYOU	11	15	15	8	14	3	3	16	4
SOLANO	73	42	58	67	62	66	52	46	65
SONOMA	122	107	157	136	108	124	131	70	67
STANISLAUS	144	134	121	117	92	91	68	50	28
SUTTER	28	19	22	19	26	27	21	14	11
TEHAMA	5	9	7	6	11	7	9	6	4
TRINITY	6	8	23	7	7	9	3	2	1
TULARE	39	41	103	66	67	89	59	34	44
TUOLUMNE	18	7	2	3	2	2	5	1	6
VENTURA	184	163	126	98	77	42	62	43	36
YOLO	29	47	44	43	25	33	50	33	25
YUBA	16	14	16	17	32	16	13	13	7
Grand Total	7498	6889	7850	7557	6111	5424	5306	4766	4029

Table E-12b Reported Incidence of Giardiasis S in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	25.6	18.2	25.3	19.6	12.1	12.3	12.1	21.2	0.0
ALPINE	0.0	0.0	265.5	0.0	0.0	87.7	0.0	0.0	0.0
AMADOR	13.3	22.7	35.0	12.5	43.2	27.7	24.4	12.0	24.0
BERKELEY	36.0	29.0	33.6	23.0	15.3	16.3	27.7	38.6	13.9
BUTTE	24.2	30.3	31.4	29.4	24.4	24.1	20.9	25.8	18.6
CALAVERAS	15.6	9.1	40.7	22.6	16.6	10.9	32.5	21.6	13.1
COLUSA	30.7	24.1	35.5	17.4	5.7	16.9	11.1	10.9	5.4
CONTRA COSTA	26.9	22.3	9.0	23.0	25.0	16.1	18.6	23.0	16.9
DEL NORTE	4.3	39.7	30.2	22.2	7.3	7.2	21.8	7.2	0.0
EL DORADO	11.1	12.3	26.1	7.3	10.6	9.8	7.6	10.4	8.1
FRESNO	35.7	46.6	43.1	34.2	30.3	27.3	17.3	9.9	11.3
GLENN	16.1	23.8	54.6	19.3	11.5	19.0	18.8	14.9	3.7
HUMBOLDT	12.6	11.6	17.2	26.8	15.3	22.5	23.2	17.5	10.3
IMPERIAL	3.7	2.6	6.7	17.4	3.8	3.0	7.2	6.4	2.1
INYO	27.4	98.4	147.5	92.6	32.5	10.8	0.0	10.9	0.0
KERN	15.2	18.2	26.4	19.7	12.1	10.6	15.0	12.4	12.9
KINGS	12.8	27.9	10.3	28.3	4.5	1.8	3.5	10.3	6.6
LAKE	35.6	40.5	39.6	48.2	22.0	27.3	52.7	3.6	3.6
LASSEN	7.2	10.8	17.8	7.0	17.5	7.0	16.3	37.8	14.9
LONG BEACH	24.9	20.3	28.2	20.2	20.3	14.6	19.4	16.6	14.1
LOS ANGELES	21.8	19.4	19.6	19.4	13.5	10.6	11.1	9.0	8.0
MADERA	3.4	6.5	16.6	5.0	11.6	10.4	7.4	6.3	2.6
MARIN	46.9	66.8	90.9	59.7	58.2	57.5	31.4	43.1	40.1
MARIPOSA	14.0	20.3	19.8	19.3	0.0	6.3	12.6	0.0	12.5
MENDOCINO	27.4	25.7	14.6	22.9	17.9	52.4	36.7	39.8	26.7
MERCED	62.2	55.6	59.0	43.8	52.1	20.7	32.8	18.0	16.7
MODOC	20.7	20.5	60.8	70.2	19.9	29.9	10.0	19.7	20.1
MONO	20.1	59.7	10.0	68.3	19.0	9.4	9.5	19.0	28.4
MONTEREY	22.8	14.7	9.5	10.8	8.2	11.3	8.3	6.8	10.0
NAPA	35.2	30.3	95.1	62.4	41.2	54.6	27.0	26.6	33.6
NEVADA	54.8	34.8	58.4	20.3	29.4	14.0	38.0	29.6	16.8
ORANGE	27.6	19.3	26.8	26.6	11.8	15.6	13.6	12.0	9.9
PASADENA	35.7	43.8	38.2	28.9	19.9	11.7	20.4	19.5	14.3
PLACER	22.6	28.6	25.0	23.2	14.9	20.0	27.6	24.5	21.9
PLUMAS	15.2	181.4	266.7	97.3	38.8	29.3	19.6	39.3	39.1
RIVERSIDE	14.2	13.2	13.2	15.0	7.4	9.0	7.8	7.4	6.3
SACRAMENTO	23.1	30.9	24.6	18.0	8.6	5.6	5.6	6.8	9.2
SAN BENITO	16.4	21.4	28.8	25.4	4.9	4.8	13.8	33.3	14.9
SAN BERNARDINO	12.5	11.0	13.3	14.5	13.4	8.1	7.7	8.4	6.0
SAN DIEGO	12.7	12.2	19.2	28.2	26.3	21.6	18.9	16.7	16.3
SAN FRANCISCO	45.9	39.5	35.8	46.6	53.8	54.5	53.3	49.7	46.0
SAN JOAQUIN	61.4	54.3	59.4	38.6	48.5	37.5	33.7	21.2	18.1
SAN LUIS OBISPO	45.1	21.0	21.3	42.6	20.9	15.8	22.2	24.9	21.6
SAN MATEO	30.6	26.1	28.8	25.6	20.9	21.3	19.2	19.0	14.4
SANTA BARBARA	44.1	38.7	63.8	37.9	52.0	36.5	62.4	45.3	45.4
SANTA CLARA	43.5	36.0	36.2	39.5	35.0	32.0	27.9	22.3	18.2
SANTA CRUZ	21.8	16.0	47.1	12.3	16.4	18.8	14.0	14.3	13.7
SHASTA	12.9	13.9	15.5	17.1	19.5	8.7	2.5	5.5	4.9
SIERRA	0.0	0.0	121.2	120.5	29.9	59.3	29.6	0.0	59.9
SISKIYOU	25.3	34.3	34.2	18.1	31.4	6.7	6.8	36.2	9.0
SOLANO	21.5	12.0	16.2	18.4	16.8	17.8	14.0	12.3	17.0
SONOMA	31.4	27.1	39.2	33.4	26.2	29.8	31.0	16.3	15.3
STANISLAUS	38.9	35.1	30.9	29.2	22.6	22.1	16.3	11.9	6.5
SUTTER	43.5	28.7	32.3	27.1	36.3	37.0	28.3	18.6	14.4
TEHAMA	10.1	17.8	13.5	11.4	20.7	13.0	16.6	11.0	7.3
TRINITY	45.9	61.3	175.6	53.0	52.4	67.2	22.4	15.0	7.6
TULARE	12.5	12.8	31.4	19.7	19.7	25.7	16.8	9.6	12.2
TUOLUMNE	37.1	14.2	4.0	5.9	3.9	3.9	9.7	1.9	11.4
VENTURA	27.5	24.1	18.4	14.1	11.0	5.9	8.7	6.0	4.9
YOLO	20.5	32.8	30.3	29.3	16.9	22.1	33.0	21.5	16.1
YUBA	27.5	23.5	26.4	27.7	51.8	25.8	21.2	21.4	11.5

Table E-13a Reported Incidence of Hepatistis A in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	130	135	115	91	96	97	137	157	92
ALPINE				1					
AMADOR	2		2	5	1		3	6	
BERKELEY	14	21	14	13	16	15	38	25	21
BUTTE	44	25	37	105	251	53	72	99	16
CALAVERAS	4	2	3	6	2	7	11		
COLUSA	5	2	4		13	3	6	4	1
CONTRA COSTA	114	75	67	90	78	78	105	81	58
DEL NORTE	2	48	5	46	46	52	4	5	4
EL DORADO	48	6	6	12	11	11	30	9	2
FRESNO	149	203	160	153	157	91	129	122	64
GLENN	13	3	2	1	29	2	13	6	
HUMBOLDT	59	22	13	59	401	219	68	22	1
IMPERIAL	26	30	49	22	45	46	60	33	23
INYO	1	5	1	6	26	10	1		
KERN	168	121	310	346	491	258	171	111	290
KINGS	39	38	64	13	5	13	12	22	14
LAKE	69	51	19	14	6	23	10	9	1
LASSEN	2			8	12	2	10	9	3
LONG BEACH	127	81	70	93	124	207	198	168	73
LOS ANGELES	1395	1182	1411	1094	1120	1120	1163	1753	892
MADERA	21	25	20	11	41	20	18	17	33
MARIN	15	13	13		12	34	40	32	13
MARIPOSA	2	1		5	5		1	1	6
MENDOCINO	23	35	8	30	15	35	14	7	9
MERCED	32	49	43	39	44	35	18	24	119
MODOC	1	3		8	1	5	5	1	
MONO	1	1	2	4	3	3		4	2
MONTEREY	66	66	41	34	56	60	42	64	53
NAPA	21	9	8	10	21	16	13	12	5
NEVADA	20	3	1	9	8	8	6	8	9
ORANGE	355	291	256	375	177	405	319	348	228
PASADENA	35	25	19	38	41	20	23	23	15
PLACER	79	20	47	15	22	16	48	35	17
PLUMAS	13		2	1	6	6	2	2	
RIVERSIDE	367	193	182	149	312	339	381	340	168
SACRAMENTO	285	137	144	309	122	215	678	428	197
SAN BENITO	2	3	5	7	4	6	7	7	12
SAN BERNARDINO	480	230	162	209	361	499	565	333	247
SAN DIEGO	773	622	337	490	668	479	642	534	446
SAN FRANCISCO	259	284	381	220	293	450	581	599	287
SAN JOAQUIN	83	50	86	297	162	198	76	133	61
SAN LUIS OBISPO	32	18	13	8	21	19	19	25	9
SAN MATEO	66	60	48	45	49	66	106	78	67
SANTA BARBARA	60	64	44	67	84	84	38	71	54
SANTA CLARA	222	153	176	157	154	167	121	185	158
SANTA CRUZ	58	30	24	27	39	45	39	73	29
SHASTA	13	20	18	8	109	563	121	16	11
SIERRA				4		8			
SISKIYOU	7	4	3	3	66	52	6	4	1
SOLANO	50	19	17	25	120	45	86	93	103
SONOMA	81	98	102	87	81	107	56	39	31
STANISLAUS	80	109	240	465	154	119	75	52	36
SUTTER	23	11	6	38	91	43	9	8	16
TEHAMA	3	1	4	4	51	37	30	2	4
TRINITY	1		8		8	14	3		
TULARE	125	208	120	99	75	72	90	55	56
TUOLUMNE	5	5	2	8	11	2	5	2	1
VENTURA	99	72	40	56	45	68	78	94	101
YOLO	34	11	17	20	37	26	27	22	34
YUBA	34	23	9	92	142	80	24	10	4
Grand Total	6414	5016	5000	5651	6641	6773	6653	6422	4197

Table E-13b Reported Incidence of Hepatistis A in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	11.1	11.3	9.5	7.4	7.8	7.8	10.9	12.3	7.0
ALPINE	0.0	0.0	0.0	88.5	0.0	0.0	0.0	0.0	0.0
AMADOR	6.7	0.0	6.4	15.6	3.1	0.0	9.2	18.1	0.0
BERKELEY	13.6	20.3	13.4	12.5	15.3	14.4	36.3	23.5	19.4
BUTTE	24.2	13.5	19.7	55.2	130.4	27.2	36.7	50.1	8.0
CALAVERAS	12.5	6.0	8.7	17.0	5.5	19.1	29.8	0.0	0.0
COLUSA	30.7	12.0	23.7	0.0	74.3	16.9	33.2	21.7	5.4
CONTRA COSTA	14.2	9.2	8.1	10.7	9.1	9.0	12.0	9.1	6.4
DEL NORTE	8.5	190.5	18.9	170.4	167.6	188.4	14.5	17.9	14.2
EL DORADO	38.1	4.6	4.5	8.7	7.8	7.7	20.8	6.3	1.3
FRESNO	22.3	29.6	22.7	21.2	21.4	12.2	16.9	15.8	8.2
GLENN	52.4	11.9	7.8	3.9	111.1	7.6	48.8	22.4	0.0
HUMBOLDT	49.5	18.3	10.7	47.9	323.1	176.3	54.5	17.5	0.8
IMPERIAL	23.8	26.4	41.1	17.4	34.0	33.9	43.1	23.4	16.1
INYO	5.5	27.3	5.5	32.7	140.9	54.2	5.4	0.0	0.0
KERN	30.8	21.6	53.5	58.3	81.3	42.1	27.6	17.6	45.5
KINGS	38.4	36.5	59.9	11.9	4.5	11.4	10.4	18.9	11.6
LAKE	136.3	98.5	35.8	26.0	11.0	41.9	18.2	16.4	1.8
LASSEN	7.2	0.0	0.0	28.1	42.0	7.0	32.6	26.2	8.9
LONG BEACH	29.6	18.4	15.8	21.1	28.3	47.4	45.2	38.1	16.4
LOS ANGELES	16.8	14.0	16.6	12.7	12.9	12.8	13.2	19.7	9.9
MADERA	23.8	27.2	20.8	11.0	39.5	18.9	16.6	15.2	28.9
MARIN	6.5	5.6	5.6	0.0	5.1	14.3	16.7	13.3	5.3
MARIPOSA	14.0	6.8	0.0	32.2	31.6	0.0	6.3	6.3	37.5
MENDOCINO	28.6	42.9	9.7	36.1	17.9	41.7	16.6	8.2	10.5
MERCED	17.9	26.7	22.9	20.3	22.5	17.7	9.1	12.0	58.6
MODOC	10.3	30.7	0.0	80.2	10.0	49.8	49.8	9.9	0.0
MONO	10.0	10.0	19.9	39.0	28.4	28.3	0.0	38.1	19.0
MONTEREY	18.6	18.3	11.2	9.2	15.3	16.6	11.6	17.3	13.9
NAPA	19.0	8.0	7.0	8.7	18.0	13.7	11.0	10.0	4.1
NEVADA	25.5	3.7	1.2	10.8	9.4	9.3	6.9	9.1	10.1
ORANGE	14.7	11.9	10.3	14.8	6.9	15.6	12.1	13.0	8.3
PASADENA	26.6	18.9	14.2	28.1	30.3	14.7	16.8	16.6	10.7
PLACER	45.7	11.2	25.5	7.9	11.3	8.0	23.3	16.5	7.7
PLUMAS	65.9	0.0	9.9	4.9	29.1	29.3	9.8	9.8	0.0
RIVERSIDE	31.4	15.8	14.3	11.4	23.4	25.0	27.6	24.3	11.7
SACRAMENTO	27.4	12.9	13.3	28.1	11.0	19.3	60.3	37.6	17.0
SAN BENITO	5.5	8.0	13.1	17.8	9.9	14.4	16.1	15.5	25.6
SAN BERNARDINO	33.8	15.7	10.7	13.6	23.2	31.7	35.6	20.7	15.1
SAN DIEGO	30.9	24.5	13.0	18.7	25.3	18.0	23.9	19.6	16.0
SAN FRANCISCO	35.8	38.8	51.8	29.6	39.0	59.8	76.5	77.5	36.6
SAN JOAQUIN	17.3	10.2	17.2	58.6	31.6	38.1	14.4	24.7	11.2
SAN LUIS OBISPO	14.7	8.2	5.9	3.6	9.3	8.4	8.3	10.7	3.8
SAN MATEO	10.2	9.1	7.2	6.7	7.2	9.6	15.3	11.1	9.4
SANTA BARBARA	16.2	17.1	11.6	17.5	21.8	21.6	9.7	17.9	13.4
SANTA CLARA	14.8	10.1	11.5	10.1	9.7	10.5	7.5	11.2	9.4
SANTA CRUZ	25.2	13.0	10.3	11.5	16.4	18.8	16.1	29.7	11.6
SHASTA	8.8	13.2	11.6	5.1	68.5	351.2	75.0	9.8	6.7
SIERRA	0.0	0.0	0.0	120.5	0.0	237.4	0.0	0.0	0.0
SISKIYOU	16.1	9.2	6.8	6.8	148.1	116.5	13.5	9.1	2.3
SOLANO	14.7	5.4	4.7	6.8	32.5	12.2	23.1	24.8	27.0
SONOMA	20.9	24.9	25.4	21.3	19.6	25.7	13.3	9.1	7.1
STANISLAUS	21.6	28.5	61.2	116.1	37.8	28.9	18.0	12.3	8.4
SUTTER	35.7	16.6	8.8	54.2	126.9	58.9	12.1	10.6	20.9
TEHAMA	6.0	2.0	7.7	7.6	95.9	68.8	55.2	3.7	7.3
TRINITY	7.7	0.0	61.1	0.0	59.9	104.5	22.4	0.0	0.0
TULARE	40.1	65.1	36.6	29.6	22.0	20.8	25.6	15.5	15.6
TUOLUMNE	10.3	10.1	4.0	15.7	21.2	3.9	9.7	3.9	1.9
VENTURA	14.8	10.7	5.9	8.1	6.4	9.6	10.9	13.0	13.8
YOLO	24.1	7.7	11.7	13.6	25.1	17.4	17.8	14.3	21.9
YUBA	58.4	38.7	14.9	149.8	229.8	128.8	39.1	16.4	6.6

Table E-14a Reported Incidence of Viral Meningitis in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	30	23	37	27	6	15	12	90	29
BERKELEY	5	1	6	5	2	4	2	12	5
BUTTE	9	10	5	11	2	3	6	15	8
CALAVERAS		1						8	1
COLUSA			1						
CONTRA COSTA	19	20	37	26	21	28	11	59	10
DEL NORTE		1	1						2
EL DORADO	1	1	3	2	5	5	10	15	10
FRESNO	47	57	103	137	89	40	68	89	128
GLENN	3	2	1	5	2		1	3	
HUMBOLDT	7	1		3	2	5	4	16	7
IMPERIAL	7	10	51	33	22	8	4	17	13
INYO			3						
KERN	78	72	78	115	79	54	46	40	53
KINGS	5	1	5	3			1	5	3
LAKE	2	1	2	2	2		2	1	4
LASSEN			1		1		2	1	2
LONG BEACH	31	37	86	69	18	22	35	30	87
LOS ANGELES	328	192	895	535	263	166	191	221	446
MADERA	1	1	11	4	6	4	3	6	10
MARIN	10	12	15	1	9	6	9	25	9
MARIPOSA			1	3				1	2
MENDOCINO	1		2	1		1	4	13	11
MERCED	5	3	3	10	2	3		4	8
MODOC	2			2					
MONO			2	1	2			2	
MONTEREY	25	17	27	12	6	9	6	14	11
NAPA	11	8	12	13	5	12	16	37	2
NEVADA	13	6	9	5	4	4	6	7	10
ORANGE	205	194	714	394	110	181	204	275	586
PASADENA	2	5	5	8	3	1	4	3	12
PLACER	6	4	14	12	9	12	8	53	20
PLUMAS				2			1	2	1
RIVERSIDE	67	72	269	126	63	62	49	83	224
SACRAMENTO	40	47	42	55	72	46	39	160	101
SAN BENITO	1		1			2	1	2	2
SAN BERNARDINO	88	63	131	156	62	48	54	62	171
SAN DIEGO	170	170	498	228	210	199	97	220	514
SAN FRANCISCO	12	7	23	12	1	4	5	4	7
SAN JOAQUIN	4	6	27	9	10	15	2	33	13
SAN LUIS OBISPO	5	3	21	23	17	20	13	35	50
SAN MATEO	10	17	12	13	10	9	3	7	9
SANTA BARBARA	7	4	47	24	12	13	13	25	42
SANTA CLARA	66	66	87	85	45	47	60	160	78
SANTA CRUZ	21	18	48	15	2	6	23	19	16
SHASTA	3	4	3	6	16	21	7	68	18
SIERRA						1			
SISKIYOU	1		1					1	
SOLANO	35	16	48	32	17	19	15	90	31
SONOMA	17	12	15	18	8	7	13	29	19
STANISLAUS	32	29	61	47	67	53	44	115	74
SUTTER	3	4	4	7	5	3	4	19	9
TEHAMA	3	1	2	5	1	1		5	2
TRINITY						1		2	
TULARE	36	53	57	52	54	33	17	45	34
TUOLUMNE		5	3	4	1				2
VENTURA	44	22	104	47	24	36	29	38	117
YOLO	2	1	8	4	1	2		5	7
YUBA	4	1	6	2	2	3	2	16	8
Grand Total	1525	1301	3648	2411	1370	1234	1146	2307	3038

Table E-14b Reported Incidence of Viral Meningitis in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
ALAMEDA	2.6	1.9	3.1	2.2	0.5	1.2	1.0	7.1	2.2
BERKELEY	4.9	1.0	5.8	4.8	1.9	3.8	1.9	11.3	4.6
BUTTE	4.9	5.4	2.7	5.8	1.0	1.5	3.1	7.6	4.0
CALAVERAS	0.0	3.0	0.0	0.0	0.0	0.0	0.0	21.6	2.6
COLUSA	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0
CONTRA COSTA	2.4	2.5	4.5	3.1	2.5	3.2	1.3	6.7	1.1
DEL NORTE	0.0	4.0	3.8	0.0	0.0	0.0	0.0	0.0	7.1
EL DORADO	0.8	0.8	2.2	1.5	3.5	3.5	6.9	10.4	6.7
FRESNO	7.0	8.3	14.6	19.0	12.1	5.4	8.9	11.5	16.4
GLENN	12.1	7.9	3.9	19.3	7.7	0.0	3.8	11.2	0.0
HUMBOLDT	5.9	0.8	0.0	2.4	1.6	4.0	3.2	12.7	5.6
IMPERIAL	6.4	8.8	42.8	26.1	16.6	5.9	2.9	12.1	9.1
INYO	0.0	0.0	16.4	0.0	0.0	0.0	0.0	0.0	0.0
KERN	14.3	12.8	13.5	19.4	13.1	8.8	7.4	6.4	8.3
KINGS	4.9	1.0	4.7	2.7	0.0	0.0	0.9	4.3	2.5
LAKE	4.0	1.9	3.8	3.7	3.7	0.0	3.6	1.8	7.3
LASSEN	0.0	0.0	3.6	0.0	3.5	0.0	6.5	2.9	5.9
LONG BEACH	7.2	8.4	19.4	15.7	4.1	5.0	8.0	6.8	19.5
LOS ANGELES	4.0	2.3	10.5	6.2	3.0	1.9	2.2	2.5	5.0
MADERA	1.1	1.1	11.4	4.0	5.8	3.8	2.8	5.4	8.8
MARIN	4.3	5.2	6.4	0.4	3.8	2.5	3.8	10.4	3.7
MARIPOSA	0.0	0.0	6.6	19.3	0.0	0.0	0.0	6.3	12.5
MENDOCINO	1.2	0.0	2.4	1.2	0.0	1.2	4.7	15.2	12.8
MERCED	2.8	1.6	1.6	5.2	1.0	1.5	0.0	2.0	3.9
MODOC	20.7	0.0	0.0	20.1	0.0	0.0	0.0	0.0	0.0
MONO	0.0	0.0	19.9	9.8	19.0	0.0	0.0	19.0	0.0
MONTEREY	7.0	4.7	7.4	3.2	1.6	2.5	1.7	3.8	2.9
NAPA	9.9	7.1	10.6	11.3	4.3	10.2	13.5	30.8	1.6
NEVADA	16.6	7.5	10.9	6.0	4.7	4.7	6.9	8.0	11.2
ORANGE	8.5	7.9	28.7	15.6	4.3	7.0	7.7	10.3	21.4
PASADENA	1.5	3.8	3.7	5.9	2.2	0.7	2.9	2.2	8.6
PLACER	3.5	2.2	7.6	6.3	4.6	6.0	3.9	25.0	9.1
PLUMAS	0.0	0.0	0.0	9.7	0.0	0.0	4.9	9.8	4.9
RIVERSIDE	5.7	5.9	21.2	9.7	4.7	4.6	3.5	5.9	15.5
SACRAMENTO	3.8	4.4	3.9	5.0	6.5	4.1	3.5	14.0	8.7
SAN BENITO	2.7	0.0	2.6	0.0	0.0	4.8	2.3	4.4	4.3
SAN BERNARDINO	6.2	4.3	8.7	10.1	4.0	3.1	3.4	3.9	10.5
SAN DIEGO	6.8	6.7	19.3	8.7	8.0	7.5	3.6	8.1	18.4
SAN FRANCISCO	1.7	1.0	3.1	1.6	0.1	0.5	0.7	0.5	0.9
SAN JOAQUIN	0.8	1.2	5.4	1.8	1.9	2.9	0.4	6.1	2.4
SAN LUIS OBISPO	2.3	1.4	9.5	10.3	7.5	8.8	5.7	15.0	21.2
SAN MATEO	1.5	2.6	1.8	1.9	1.5	1.3	0.4	1.0	1.3
SANTA BARBARA	1.9	1.1	12.4	6.3	3.1	3.3	3.3	6.3	10.4
SANTA CLARA	4.4	4.4	5.7	5.4	2.8	2.9	3.7	9.7	4.6
SANTA CRUZ	9.1	7.8	20.5	6.4	0.8	2.5	9.5	7.7	6.4
SHASTA	2.0	2.6	1.9	3.8	10.1	13.1	4.3	41.8	11.0
SIERRA	0.0	0.0	0.0	0.0	0.0	29.7	0.0	0.0	0.0
SISKIYOU	2.3	0.0	2.3	0.0	0.0	0.0	0.0	2.3	0.0
SOLANO	10.3	4.6	13.4	8.8	4.6	5.1	4.0	24.0	8.1
SONOMA	4.4	3.0	3.7	4.4	1.9	1.7	3.1	6.8	4.4
STANISLAUS	8.6	7.6	15.6	11.7	16.5	12.9	10.6	27.3	17.3
SUTTER	4.7	6.0	5.9	10.0	7.0	4.1	5.4	25.2	11.8
TEHAMA	6.0	2.0	3.9	9.5	1.9	1.9	0.0	9.2	3.6
TRINITY	0.0	0.0	0.0	0.0	0.0	7.5	0.0	15.0	0.0
TULARE	11.5	16.6	17.4	15.5	15.8	9.5	4.8	12.6	9.4
TUOLUMNE	0.0	10.1	6.0	7.8	1.9	0.0	0.0	0.0	3.8
VENTURA	6.6	3.3	15.2	6.8	3.4	5.1	4.1	5.3	16.0
YOLO	1.4	0.7	5.5	2.7	0.7	1.3	0.0	3.3	4.5
YUBA	6.9	1.7	9.9	3.3	3.2	4.8	3.3	26.3	13.2

Table E-15a Reported Incidence of Toxoplasmosis in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
BERKELEY						1			1
BUTTE									1
CONTRA COSTA									1
HUMBOLDT							1		
LAKE							1		
LONG BEACH	1			2		1	1	1	1
LOS ANGELES	30	13	7	49	12	39	27	22	14
MENDOCINO									1
MERCED									1
MONTEREY	1							1	1
ORANGE	1								
PASADENA			1				1	1	
RIVERSIDE	1	4	1		2				
SACRAMENTO	5								
SAN BERNARDINO	2				1				2
SAN DIEGO		2			2	1	1		
SAN FRANCISCO	148	1							
SAN LUIS OBISPO									1
SAN MATEO	3	1							
SHASTA									2
SOLANO								1	1
SONOMA				1					
Grand Total	192	21	9	52	17	42	32	27	27

Table E-15b Reported Incidence of Toxoplasmosis in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
BERKELEY	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.9
BUTTE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
CONTRA COSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
HUMBOLDT	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
LAKE	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0
LONG BEACH	0.2	0.0	0.0	0.5	0.0	0.2	0.2	0.2	0.2
LOS ANGELES	0.4	0.2	0.1	0.6	0.1	0.4	0.3	0.2	0.2
MENDOCINO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
MERCED	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
MONTEREY	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
ORANGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PASADENA	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.7	0.0
RIVERSIDE	0.1	0.3	0.1	0.0	0.2	0.0	0.0	0.0	0.0
SACRAMENTO	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SAN BERNARDINO	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
SAN DIEGO	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
SAN FRANCISCO	20.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SAN LUIS OBISPO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
SAN MATEO	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHASTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
SOLANO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
SONOMA	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0

Table E-16a Reported Incidence of Taenia Tapeworm Infection in California (1990-1998)

	Reported Cases by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
BUTTE						1			
KERN								1	
LOS ANGELES	7	8	8	2	7	6		1	1
MONTEREY	1								
NAPA			1						
ORANGE	2	9	4			3	1	1	
PASADENA						1			
RIVERSIDE			1						
SAN BERNARDINO	1							1	
SAN DIEGO		1							
SAN FRANCISCO		1	2						
SANTA CLARA	1	27	2	3	2				
SONOMA	2								
STANISLAUS	2								
TULARE									1
Grand Total	16	46	18	5	9	11	1	4	2

Table E-16b Reported Incidence of Taenia Tapeworm Infection in California (1990-1998)

	Disease Incidence/100,000 by Year								
Local Health Department	1990	1991	1992	1993	1994	1995	1996	1997	1998
BUTTE	0.000	0.000	0.000	0.000	0.000	0.514	0.000	0.000	0.000
KERN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.159	0.000
LOS ANGELES	0.084	0.095	0.094	0.023	0.080	0.069	0.000	0.011	0.011
MONTEREY	0.281	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NAPA	0.000	0.000	0.880	0.000	0.000	0.000	0.000	0.000	0.000
ORANGE	0.083	0.368	0.161	0.000	0.000	0.116	0.038	0.037	0.000
PASADENA	0.000	0.000	0.000	0.000	0.000	0.733	0.000	0.000	0.000
RIVERSIDE	0.000	0.000	0.079	0.000	0.000	0.000	0.000	0.000	0.000
SAN BERNARDINO	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.062	0.000
SAN DIEGO	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SAN FRANCISCO	0.000	0.137	0.272	0.000	0.000	0.000	0.000	0.000	0.000
SANTA CLARA	0.067	1.781	0.130	0.192	0.126	0.000	0.000	0.000	0.000
SONOMA	0.515	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
STANISLAUS	0.540	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TULARE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.278